ENERGY CONSERVATION
THROUGH THERMAL UPGRADING OF BUILDINGS
IN ATTAWAPISKAT, ONTARIO

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Prepared for:

Attawapiskat Band Council

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ENERGY CONSERVATION THROUGH THERMAL UPGRADING OF BUILDINGS IN ATTAWAPISKAT, ONTARIO

EXECUTIVE SUMMARY

This study prepared by Scanada Consultants Limited and Con-Serve Group Limited evaluates and defines the potential for reducing the present space heating energy consumption for buildings in the community of Attawapiskat, Ontario. The study was supported by Energy, Mines and Resources (EMR) Canada's "Remote Community Demonstration Program". Careful field investigations of the buildings in the community and discussions with Chief John B. Nakogee and members of the Band Council preceeded the analysis and the development of suitable, energy conservation measures. Energy upgrades were defined to suit the specific requirements of a remote community. Appropriate materials, along with estimates of installed costs, and illustrated outlines of the installation methods have been outlined for each conservation method.

To help initiate the implementation of the suggested conservation measures, an overall plan was developed to link specific building groups with the required upgrade measures. Priorities were then established to pinpoint which groups were in greatest need of retro-fit, and therefore where the cost-benefit would probably be the best.

Part of the technology transfer also included a review of the sources of funding available to assist in the execution of the desired energy upgrades. The community of Attawapiskat is well suited for the implementation

of various energy conservation measures. Its residential and commercial/institutional buildings presently have numerous energy weaknesses, but they can generally be corrected quite readily and in a cost-effective manner. Local construction people can effectively work with other members of the community to correct most of these deficiencies.

Several potential upgrade measures have been identified that are well suited to remedy the energy weaknesses in Attawapiskat. The potential measures are:

ECM 1: Wall Retrofit - Exterior Application
ECM 2: Wall Retrofit - Interior Application
ECM 3: Attic Insulation
ECM 4: Floor Insulation
ECM 5: Air Tightening Walls
ECM 6: Improve Heat Distribution
ECM 7: Window Replacement
ECM 8: Interior Storm Windows
ECM 9: Weatherstrip Windows
ECM 10: Storm Door
ECM 11: Insulated Door Cover
ECM 12: Metal Clad Insulated Door
ECM 13: Weatherstrip Doors

Upgrade measures have been recommended for each building group as stated in the "Implementation Plan". Virtually all of the homes require upgraded attic insulation and air tightening of the exterior walls. Window and door weatherstripping is required on all but the newest structures.

The total estimated cost of implementing all of the

appropriate upgrade measures would be approximately $312,000.00. Based on calculated energy savings, these retrofits would save the community approximately 640 full cords of firewood per year. The community feels that a face cord is worth about $35, or $105 per full cord.

Implementation of the recommended energy upgrade measures would therefore save the community about $67,000 per year, resulting in a simple payback for the program of 4.5 years.

As energy conservation principles become more widely applied in Attawapiskat, other remote communities will hopefully become aware of the potentials to reduce energy consumption levels and to greatly improve comfort levels of their houses.

ÉCONOMIES D'ÉNERGIE PAR AUGMENTATION DU RENDEMENT THERMIQUE DES BÂTIMENTS À ATTAWAPISKAT (ONTARIO)

Résumé

Cette étude, exécutée par "Scanada Consultants Limited" et "Con-Serve Group Limited", détermine et évalue les possibilités de réduire la consommation d'énergie dans le chauffage des bâtiments à Attawapiskat, en Ontario. L'étude, exécutée pour le compte de la collectivité de Attawapiskat, a reçu une contribution du Programme de démonstration dans les collectivités éloignées d'Énergie, Mines et Ressources Canada.

Des examens minutieux des cent trois maisons et des cinq commerces et établissements, et des entreprises avec le Chef (John B. Nakogee) et les membres du conseil de bande ont précédé l'analyse et l'élaboration de mesures d'économie d'énergie appropriées.

Les résultats de l'étude ont montré que les commerces et les établissements étaient en assez bon état. Des améliorations mineures ont été suggérées. Toutefois, il en était autrement des maisons. En général, les soffites et les toits étaient en bon état. Dans l'ensemble, les entretoits étaient insuffisamment isolés et pouvaient être rénovés facilement de manière rentable. Les plafonds étaient en mauvais état dans sept des douze types de maisons. Alors que la plupart des maisons récentes avaient un revêtement extérieur en vinyle qui était en bon état, les autres maisons avaient un revêtement de contre-plaqué peint qui était en très mauvais état. Dans la plupart des cas, le niveau d'isolation des murs est suffisant. En général, les fenêtres avaient un double vitrage et des châssis coulissants. Il n'y avait pas ou à peu près pas de coupe-bise autour des portes et des fenêtres, ou ils étaient insuffisants. Dans quatre types de maisons, le plancher n'était pas isolé.

Les dommages notés à l'intérieur, soit les taches marquant les plafonds, la poussière, la moisissure, le renflement des murs et le bombement des plafonds jusqu'au point d'écroulement, ont dénoté de sérieux problèmes: humidité excessive, fuites d'air et pertes de chaleur, ainsi que l'instabilité de nombreuses maisons.

Cent maisons étaient chauffées au bois. La consommation variant de cinq à trente-deux cordes par année. Les trois autres maisons, les commerces et les établissements sont chauffés au mazout.

L'étude a déterminé des rénovations possibles et le coût de chacune, installation comprise. Il s'agit du coût estimatif des matériaux, du transport à partir de Kapuskasing et de la main-d'oeuvre. Les coûts sont calculés pour une maison de 11 m par 7,4 m. Voici les rénovations et leurs coûts: réfection des murs par l'extérieur, 4 000 $ par maison; réfection des murs par l'intérieur, 1 200 $ par maison; isolation de l'entretoit, de 200 à 850 $ par maison, selon la quantité ajoutée; isolation du plancher, de 200 $ à 950 $ par maison, selon la quantité ajoutée; améliorer l'étanchéité des murs, 225 $ par maison; amélioration de la distribution de la chaleur, 700 $ par maison; remplacement des fenêtres, 300 $ par maison; contre-fenêtres intérieures, 225 $ par maison; coupe-bise autour des fenêtres, 200 $ par maison; contre-portes, 265 $ par porte; revêtement isolant pour porte, 75 $ par porte; porte isolée à revêtement métallique 470 $ par porte; et coupe-bise autour des portes, 60 $ par porte. Le rapport comprend des diagrammes et des instructions indiquant comment installer chaque option.

Afin de mettre en oeuvre les mesures d'économie suggérées; un plan visant à relier des groupes de bâtiments particuliers aux rénovations requises a été élaboré. Des priorités ont ensuite été établies afin de déterminer quels groupes avaient le plus besoin de travaux de réfection et, par conséquent, quels cas présentaient le rapport "coût-avantages" le plus élevé.

Si toutes les mesures recommandées étaient mises en oeuvre dans toutes les maisons qui en avaient besoin, le coût total serait de 312 000 $. Il est estimé que ces améliorations pourraient faire économiser environ 640 cordes de bois pour le chauffage par année à la collectivité. Etant donné que la collectivité estime que le bois a une valeur de 105 $ par corde, la mise en oeuvre des mesures d'économie suggérées pourrait faire réaliser des économies de l'ordre 67 000 $ par année à la collectivité, occasionnant ainsi un simple remboursement de 4,5 années. Toutefois, le rapport mentionne certaines précautions à prendre avant d'entreprendre les travaux. Par exemple, il faut vérifier la charpente des maisons, en particulier les fondations. À moins que les maisons soient de niveau et stables, certains travaux de réfection seraient du gaspillage.

Le rapport a également fait état de sources de financement qui couvrent en partie le coût des travaux permettant d'augmenter le rendement énergétique. Pour résumer, citons les programmes de la Société canadienne d'hypothèques et de logement; d'Énergie, Mines et Ressources Canada; du ministère des Affaires indiennes et du Nord canadien; du ministère des Affaires municipales et du Logement de l'Ontario; et de l'"Association of Municipalities of Ontario".

Le rapport conclut que la collectivité de Attawapiskat se prête à la mise en oeuvre des différentes mesures d'économie d'énergie. Ses maisons, ses commerces et ses établissements présentent de nombreux points faibles pour ce qui est du rendement énergétique, mais il est généralement possible d'y remédier assez facilement et de façon rentable. En travaillant de concert avec d'autres membres de la collectivité, les ouvriers de la construction qui y habitent peuvent réussir à combler la plupart de ces lacunes.

ENERGY CONSERVATION THROUGH THERMAL UPGRADING OF BUILDINGS IN ATTAWAPISKAT, ONTARIO

Final Report To: Chief John B. Nakogee
Attawapiskat Band Council
Attawapiskat, Ontario

By: Scanada Consultants Limited
Con-Serve Group Ltd.

1. INTRODUCTION

Scanada Consultants Limited and Con-Serve Group Ltd. jointly undertook this study to identify and define the potential for energy conservation through thermal upgrading of buildings in the community of Attawapiskat, Ontario. This energy conservation study was supported by Energy, Mines and Resources (EMR) Canada's "Remote Community Demonstration Program".

The objectives of the study were:

- To identify methods of reducing the present consumption of wood and fuel oil used for space heating of buildings in the Attawapiskat community.

- To increase the awareness by the local population of conservation methods through the cooperation of the Chief and Band Council.

- To suggest how energy conservation technology may be transferred to other remote communities.

The overall purpose of this project was to create guidelines to help remote communities, such as Attawapiskat, achieve greater self-sufficiency in energy through reduced long-term energy requirements.

Viable energy conservation options that are consistent with local resources were evaluated and an implementation plan of corrective measures was prepared to provide the basis for the community to pursue appropriate options.

"Hands-on" examination of the buildings in Attawapiskat - over 103 residential units and 5 commercial/ institutional buildings - took place from April 9th to April 18th, 1984, to ensure that unique local conditions were not overlooked. With a full understanding of the local circumstances, energy upgrade actions were defined. Appropriate materials, their sources, installed costs, and methods of installation have been outlined for each conservation method.

Sources of funding to help support the implementation of the upgrade program were also reviewed and clarified.

The thermal upgrading of buildings, as defined in this report, will provide opportunities for constructive local employment. Efforts that are now being spent on preparing fire wood supplies can be redirected into projects that will save the community energy and greatly increase the life expectancy of the buildings.

On a broader scale, it is evident that the conservation methods outlined for Attawapiskat will also apply to other remote communities with similar building conditions.

2. FIELD SURVEY APPROACH

The field investigations of the buildings in Attawapiskat enabled our project manager and field technicians to obtain a clear insight into the building conditions at Attawapiskat.

Scanada's inspection team arrived in Attawapiskat on April 9th, 1984, and remained there until April 18th, 1984. The initial two days included meetings with the Chief and various members of the Band Council. Energy, Mines and Resources Canada representatives were also present and assisted in the project start-up. The buildings in Attawapiskat were inspected using several building diagnostic techniques, described in the following sections, to assess the potential for making the building more energy efficient and comfortable.

2.1 Review of Community Plans

Prior to the visit to Attawapiskat, a meeting was held with Indian and Northern Affairs Canada, in Toronto, to review the latest version of the Attawapiskat community plan. The community plan clearly outlined the location and size of the majority of the buildings in Attawapiskat.

2.2 Preparation of Data Collection Forms

Data collection forms were developed and printed prior to the field work in Attawapiskat. Two different forms were prepared. One was designed to record the inspection data obtained during a detailed inspection, and a more general form, derived from the first, was developed for the inspection of the other similar buildings. A sample copy (completed) of each of the detailed and general survey forms is included in Appendix A.

2.3 Preparation of Data Collection Protocols

The objective during the field survey inspections was to inspect the majority of the inhabited buildings in Attawapiskat using a variety of inspections techniques.

Based on the assumption that there would be groups of similar housing units in Attawapiskat, data collection protocols were established for two different types of residential inspections; a general inspection and a detailed inspection. Representative houses (i.e. houses representative of a group of similar units) within the community were selected for a thorough detailed inspection to determine their thermal performance. The other units that were similar to the representative houses in age, style, and construction characteristics, were inspected using the general procedure.

To assess the thermal performance of some of the residential, commercial, and institutional buildings in Attawapiskat, infrared thermography was used. Thermography provides a quick, accurate thermal record of the entire building envelope and with correct interpretations, it can be used to pinpoint the thermal weaknesses and thereby identify opportunities for thermal upgrading.

The following descriptions clarify the difference between the protocols for a general residential inspection and a detailed inspection:

General Inspection Procedure:

i) Each housing unit within the community was visited and visually inspected. A concise checklist was then completed to record the main energy upgrade needs.

ii) Each of these houses was measured from the exterior to obtain overall building dimensions to serve as the basis for estimating quantities of materials required for upgrade work in the future.

iii) Interior temperature and relative humidity readings were also recorded for those units where access was possible. Interior building problems were also noted and recorded.

Detailed Inspection Procedure:

i) In addition to exterior measurements of the building's dimensions, door and window sizes were measured and recorded.

ii) Fiber optic observations were made of exterior wall components to determine and verify the wall construction.

iii) Moisture probing in the wall cavities was done to establish condition.

iv) Visual observations were made of the attic areas and the underside of the buildings (when readily accessible).

v) A photo record (colour slides) was taken to display the essential components of the buildings.

vi) The type, size and observed condition of the heating system was recorded.

vii) Comments pertaining to the comfort levels, as described by the occupants, were recorded.

2.4 Inspection Set-up in Attawapiskat

The preliminary task, once the inspection team arrived in Attawapiskat, was to prepare a workplan for the actual inspection of the community buildings. Detailed notes and photographs were taken during initial town walk-throughs to establish and map groups of similar housing units, and to record non-residential buildings.

Generally, houses of similar ages were easily recognized. The building packages purchased for a given year were generally based on one common design with the building materials and thermal characteristics consistent.

Based on the initial walk-throughs, fourteen (14) residential units were designated to receive a detailed inspection. An additional eighty-nine (89) housing units were accessible and a general inspection was conducted on each. To obtain a complete picture of the housing types in Attawapiskat, housing units that were locked or boarded up were also observed and an assessment was made to assign these eighty-seven (87) housing units into one of the building groups.

To summarize, the following residential inspections took place:

14	Detailed Inspections
89	General Inspections
87	Exterior Observations
∴ 190	Houses were reviewed

The community plan in Appendix B clearly identifies the buildings that received a detailed inspection. Other houses on the plan that are labelled with a letter received a general or exterior inspection. Houses with similar letters are members of the same building group, i.e. they have similar dates of construction, construction details and heating systems.

As part of the initial inspection set-up, several residential and non-residential buildings were designated to receive a general exterior infrared survey. Thermal images were recorded for the following non-residential structures:

- The Band Office
- The School
- The Teachers' Residence
- The Nurses' Residence
- The James Bay General Hospital (Attawapiskat Wing)

These buildings are also clearly labelled on the community plan.

3. ON-SITE BUILDING INSPECTIONS

3.1 Overview

The on-site building inspections were conducted with the help and assistance of Band Council members. One member was made available to help the inspection team gain access to the buildings. He frequently explained the nature of the inspection program to the occupants. Input from local building occupants and Band members was recorded whenever available.

As described in Section 2.2, "Preparation of Data Collection Protocols", a variety of field inspection techniques were used to evaluate the thermal condition of the houses and buildings.

3.2 Residential Building Inspection Results

The following table identifies the Building Group Categories, the number of houses in each group that received the detailed inspections, and the number of houses in each group that received other inspections or observations:

TABLE 1.0 RESIDENTIAL ON-SITE BUILDING INSPECTIONS

Building Groups	Detailed Inspection Lot #	# of Houses	General Inspection # of Houses	Exterior Observations # of Houses	Total No. of Houses
A	227	1	10	11	22
B	224	1	15	10	26
C	244 & 532	2	23	18	43
D	262	1	3	5	9
E	183	1	3	0	4
F	187 & 492	2	3	6	11
G	462	1	5	3	9
H	478	1	7	12	20
I	170	1	11	7	19
J	524	1	1	5	7
K	481	1	4	2	7
L	498	1	0	4	5
M*	n/a	0	4	4	8
TOTALS		14	89	87	190

* NOTE: M represents "Miscellaneous" housing units that did not fit into one of the 12 building categories.

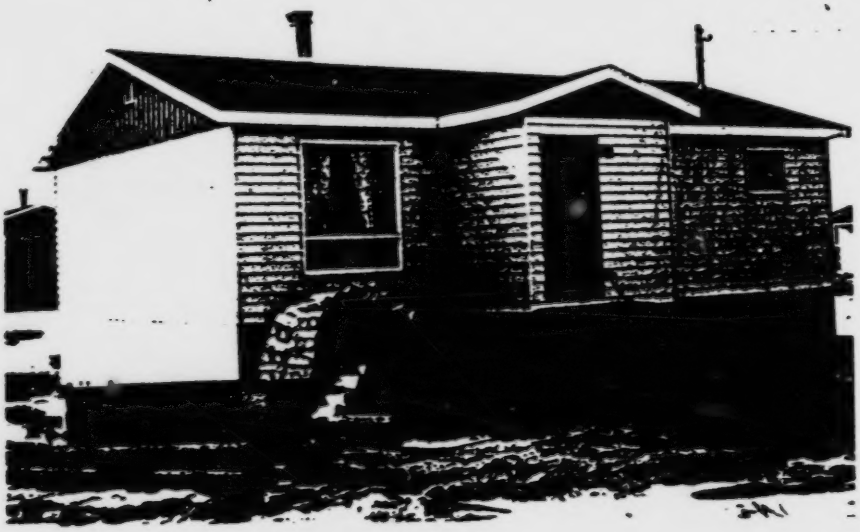
Each house that was inspected in Attawapiskat is identified by a code number such as "478-H". In such case, the number "478" represents the lot number as provided by the Band Council and the letter "H" is an assigned identification that defines the building category into which house #478 has been grouped.

Photographs were taken during the inspections and an exterior photo of each house that received a detailed inspection has been included on the next few pages.

BUILDING GROUP A - 22 HOUSES

Detailed Inspection: Lot #227
Year Built: 1982 Length x Width (M) 11x7.3
Heating Fuel: Wood
Present Wall RSI Value: 3.5
Attic RSI Value: 3.5
Floor RSI Value: 3.5

BUILDING GROUP B - 26 HOUSES



Detailed Inspection: Lot #224
Year Built: 1983 Length x Width (M) 11x7.4
Heating Fuel: Wood
Present Wall RSI Value: 3.5
Attic RSI Value: 4.9
Floor RSI Value: 4.9

BUILDING GROUP C - 43 HOUSES

Detailed Inspection: Lot #244
Year Built: 1974 Length x Width (M) 11x7.3
Heating Fuel: Wood
Present Wall RSI Value: 2.1
Attic RSI Value: 1.4
Floor RSI Value: 1.4

BUILDING GROUP D - 9 HOUSES

Detailed Inspection: Lot #262
Year Built: 1978 Length x Width (M) 11.1x7.4
Heating Fuel: Wood
Present Wall RSI Value: 2.1
Attic RSI Value: 3.5
Floor RSI Value: 2.1

BUILDING GROUP E - 4 HOUSES

Detailed Inspection: Lot #183
Year Built: 1979 Length x Width (M) 11.1x7.4
Heating Fuel: Wood
Present Wall RSI Value: 2.1
Attic RSI Value: 2.1
Floor RSI Value: 2.1

BUILDING GROUP F - 11 HOUSES

Detailed Inspection: Lot #187
Year Built: 1980 Length x Width (M) 11.1x7.4
Heating Fuel: Wood
Present Wall RSI Value: 2.1
Attic RSI Value: 2.1
Floor RSI Value: 2.1

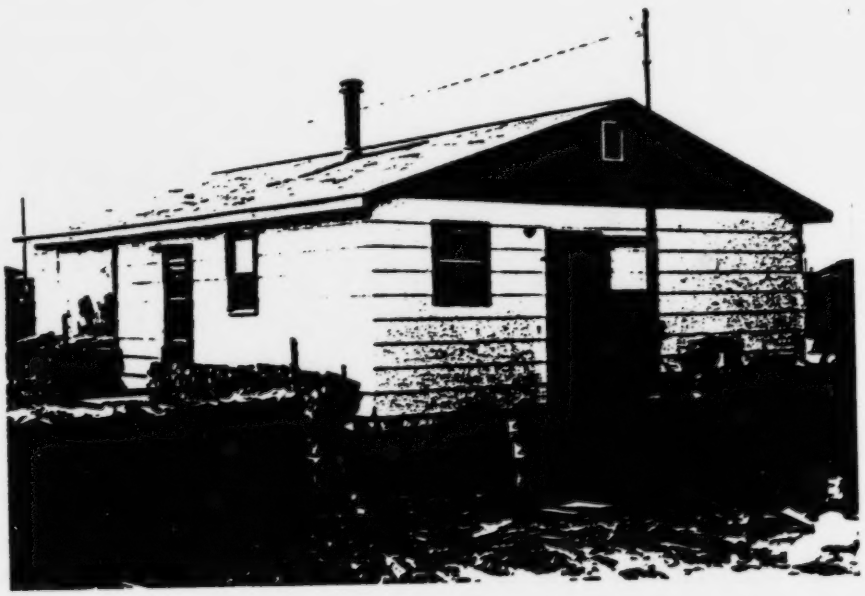
BUILDING GROUP G - 9 HOUSES

Detailed Inspection: Lot #462
Year Built: 1959 Length x Width (M) 8.4x7.9
Heating Fuel: Wood
Present Wall RSI Value: 2.1
Attic RSI Value: 2.1
Floor RSI Value: Nil

BUILDING GROUP H - 20 HOUSES

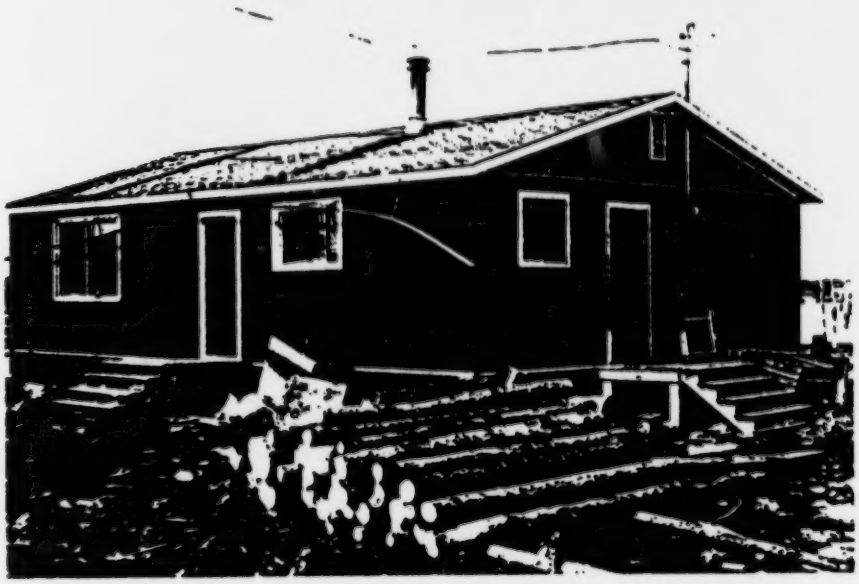
Detailed Inspection: Lot #478
Year Built: 1952 Length x Width (M) 6.1x5.2
Heating Fuel: Wood
Present Wall RSI Value: 2.1
Attic RSI Value: 1.4
Floor RSI Value: 2.1

BUILDING GROUP I - 19 HOUSES



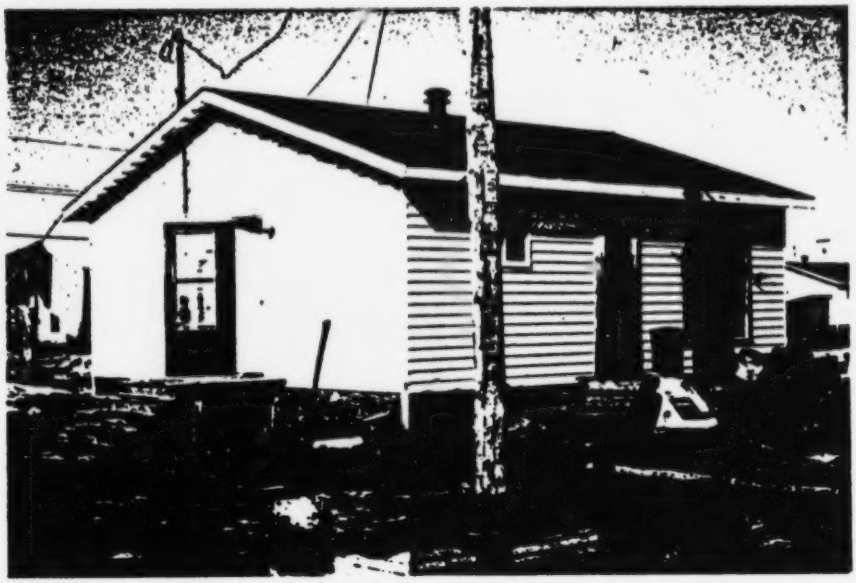
Detailed Inspection: Lot #170
Year Built: 1974 Length x Width (M) 11.4x7.4
Heating Fuel: Wood
Present Wall RSI Value: 2.1
Attic RSI Value: 2.1
Floor RSI Value: 2.1

BUILDING GROUP J - 7 HOUSES



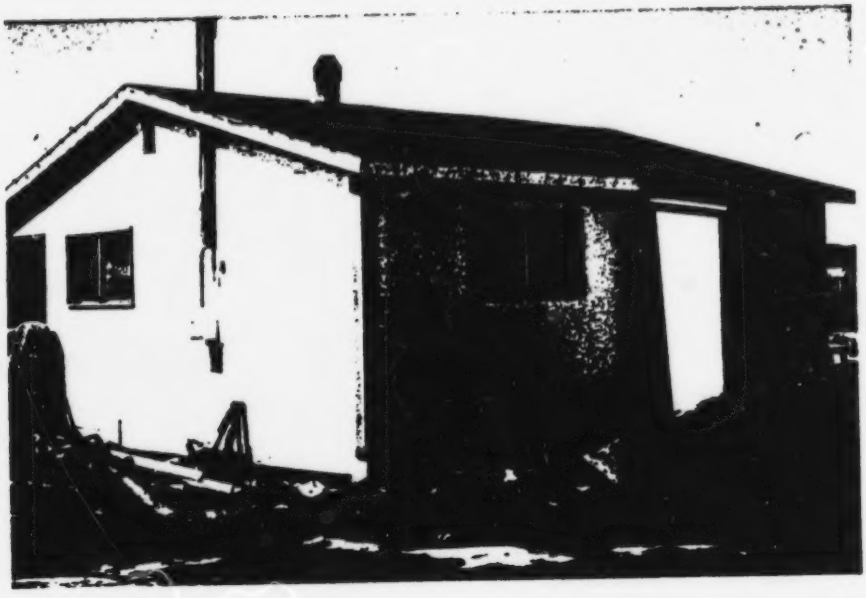
Detailed Inspection: Lot #524
Year Built: 1972 Length x Width (M) 11.1x7.4
Heating Fuel: Wood
Present Wall RSI Value: 2.1
Attic RSI Value: .9
Floor RSI Value: Nil

BUILDING GROUP K - 7 HOUSES



Detailed Inspection: Lot #481
Year Built: 1981 Length x Width (M) 7.4x7.4
Heating Fuel: Wood
Present Wall RSI Value: 2.1
Attic RSI Value: 3.5
Floor RSI Value: 4.9

BUILDING GROUP L - 5 HOUSES



Detailed Inspection: Lot #498
Year Built: 1970 Length x Width (M) 7.5x7.5
Heating Fuel: Wood
Present Wall RSI Value: 2.1
Attic RSI Value: 2.1
Floor RSI Value: Nil

During the field inspections of the housing units, all of the information gathered to describe the buildings suitability and need for energy upgrade improvements was systematically recorded on the general or detailed data collection forms.

The data tabulated in the field, from both the general and detailed surveys, was then put into a computer data base. To enable proper evaluation, the data was correlated according to building group.

Tables 2.0 to 7.0 outline the summary of the residential building inspection findings. These results were obtained during the detailed inspections and have been compared to the field data from the additional general inspections to ensure that these units are in fact representative of the various building groups.

TABLE 2.0 GENERAL HOUSING CHARACTERISTICS AND PRESENT INSULATION LEVELS

GENERAL BUILDING DESCRIPTION				PRESENT INSULATION LEVELS							
Bldg. Group	Year Built	Length x Width (M)	Heating Fuel	Wall RSI Value	Wall Insul. Type	Attic RSI Value	Attic Insul. Type	Floor RSI Value	Floor Insul. Type	Air/Vapour Barrier	Indoor Relative Humidity
A	82	11 x 7.3	Wood	3.5	Fibreglass	3.5	Fibreglass	3.5	Fibreglass	Yes	33%
B	83	11 x 7.4	Wood	3.5	Fibreglass	4.9	Fibreglass	4.9	Fibreglass	Yes	27%
C	74	11.1 x 7.5	Wood	2.1	Fibreglass	1.4	Fibreglass	1.4	Fibreglass	No	24%
D	78	11.1 x 7.4	Wood	2.1	Fibreglass	3.5	Fibreglass	2.1	Fibreglass	No	22%
E	79	11.1 x 7.4	Wood	2.1	Fibreglass	2.1	Fibreglass	2.1	Fibreglass	Yes	26%
F	80	11.1 x 7.4	Wood	2.1	Fibreglass	2.1	Fibreglass	2.1	Fibreglass	Yes	26%
G	59	8.4 x 7.9	Wood	2.1	Fibreglass	2.1	Fibreglass	None	None	Yes	42%
H	52	6.1 x 5.2	Wood	2.1	Fibreglass	1.4	Fibreglass	2.1	Fibreglass	Yes	29%
I	74	11.4 x 7.4	Wood	2.1	Fibreglass	2.1	Fibreglass	2.1	Fibreglass	Yes	34%
J	72	11.1 x 7.4	Wood	2.1	Fibreglass	0.87	Mineral Wool	None	None	Yes	10%
K	81	7.4 x 7.4	Wood	2.1	Fibreglass	3.5	Fibreglass	4.9	Fibreglass	Yes	46%
L	70	7.5 x 7.5	Wood	2.1	Fibreglass	2.1	Fibreglass	None	None	Yes	61%

COMMENTS: This table, based on field observations and measurements, provides the overall dimensions and age of the structure, the primary heating fuel and states the present insulation levels and insulation types.

TABLE 3.0 EXTERIOR AND INTERIOR FINISHES - TYPE AND CONDITION

	DWELLING EXTERIOR									INTERIOR ANALYSIS				ATTIC	
Bldg. Group	Flue	Roof Condition	Soffit Condition	Siding Type	Siding Condition	Caulking Condition	Foundation Type	Height Above Grade (M)	Grading Condition	Interior Wall Finish	Wall Condition	Int. Ceiling Finish	Ceiling Condition	Attic Type	Attic Ventilation
A	Yes	Good	Good	Vinyl	Good	Good	Wood Blocking	1.4	Poor	Prefinished Panelling	Good	Tile	Poor	Full	Yes
B	Yes	Good	Good	Vinyl	Good	Poor	Stud/Frame	1.2	Poor	Prefinished Panelling	Good	Tile	Good	Full	Yes
C	Yes	Good	Good	Plywood Panel	Poor	Poor	Wood Blocking	0.5	Poor	Prefinished Panelling	Good	Tile	Poor	Full	Yes
D	Yes	Good	Good	Vinyl	Good	nil	Wood Blocking	0.8	Poor	Prefinished Panelling	Good	Tile	Poor	Full	Yes
E	Yes	Poor	Good	Hardboard	Poor	nil	Wood Blocking	0.5	Poor	Prefinished Panelling	Good	Tile	Poor	Full	Yes
F	Yes	Good	Good	Vinul	Good	nil	Wood Blocking	0.6	Poor	Prefinished Panelling	Poor	Tile	Poor	Full	Yes
G	Yes	Good	Poor	Wood	Poor	nil	Wood Blocking	0.3	Poor	Prefinished Panelling	Poor	Tile	Good	Full	Yes
H	Yes	Good	Good	Wood	Good	nil	Log	0.6	Poor	Prefinished Panelling	Good	Tile	Good	Full	Yes
I	Yes	Good	Good	Hardboard	Good	Poor	Wood Blocking	0.8	Poor	Prefinished Panelling	Poor	Tile	Good	Full	Yes
J	Yes	Good	Good	Aluminum	Good	Poor	Wood Blocking	0.6	Poor	Prefinished Panelling	Poor	Plywood Sheet	Good	Full	Yes
K	Yes	Good	Good	Vinyl	Good	nil	Wood Blocking	0.9	Poor	Prefinished Panelling	Poor	Tile	Good	Full	Yes
L	Yes	Good	Good	Plywood	Poor	nil	Wood Blocking	0.5	Poor	Prefinished Panelling	Poor	Fibreboard	Poor	Full	Yes

COMMENTS: This table, also based on field observations, identifies the main building materials and states their condition.

TABLE 4.0 INTERIOR BUILDING PROBLEMS

Bldg. Group	OBSERVED INTERIOR BUILDING PROBLEMS									
	Problem	# of Rooms	Problem	# of Rooms	Problem	# of Rooms	Problem	# of Rooms	Problem	# of Rooms
A	Ceiling stains	2	Ceiling collapse	1	Wall bulges	1				
B	Ceiling stains	2	Wall bulges	1						
C	Ceiling stains	6	Ceiling dust marking	1	Ceiling deterioration	3	Ceiling collapse	3	Window frame rotting	1
D	Ceiling stains	5	Ceiling mould	5	Ceiling deterioration	4	Wall stains	1		
E	Ceiling stains	2	Ceiling mould	2	Ceiling dust marking	1	Wall bulges	3	Uneven floors	1
F	Ceiling stains	4	Ceiling dust marking	1	Ceiling deterioration	1	Ceiling collapse	1		
G	NO PROBLEMS									
H	NO PROBLEMS									
I	NO PROBLEMS									
J	Ceiling dust marking	5								
K	Window mould	1								
L	Ceiling dust marking	4								

COMMENTS: This table, based on field observations, states building degradation problems and indicates the number of rooms in the house that are affected with this problem.

TABLE 5.0 COMFORT LEVELS/BUILDING PROBLEMS

	REPORTED COMFORT LEVELS/BUILDING PROBLEMS							
Bldg. Group	Int. Rel. Humidity	Room Temperature	Floor Temperature	Heat Distribution	DRAFTS: Doors	Windows	Floors	Electrical Outlets
A		X	X	X	X	X	X	
B					X			X
C			X		X	X		
D			X		X			
E		X	X			X		X
F			X		X	X		
G			X		X	X	X	
H			X		X	X		
I		X						
J			X	X	X	X		
K	X		X	X	X	X	X	X
L	X	X	X	X	X	X	X	X

COMMENTS: This table, based on comments obtained from the occupants of the homes, indicates with an X, areas where the comfort levels are inadequate.

TABLE 6.0 WINDOW SCHEDULE

Bldg. Group	WINDOW SCHEDULE																Sill/ Frame Condition
	TYPE - 1				TYPE - 2				TYPE - 3				TYPE - 4				
	#	Size (mm)	Style	W/S	#	Size (mm)	Style	W/S	#	Size (mm)	Style	W/S	#	Size (mm)	Style	W/S	
A.	4	813 x 686	Slider Double glazing	P	1	686 x 686	Slider Double glazing	P	1	1142 x 1702	Slider Double glazing	P	1	1448 x 1702	Slider Double glazing	P	Good
B	4	838 x 686	Slider Double glazing	P	1	686 x 686	Slider Double glazing	P	1	1118 x 1702	Slider Double glazing	P	1	1422 x 1676	Slider Double glazing	P	Good
C	3	711 x 965	Single hung Wood storm	P	1	711 x 787	Single hung Wood storm Single glazed	P	1	2235 x 1372	Single hung Wood storm	P	1	737 x 991	Single hung Wood storm	P	Poor
D	4	1143 x 830	Fixed glazing Slider Double glazing	P	1	1397 x 1676	Slider Double glazing	G									Good
E	4	1397 x 762	Fixed glazing Slider Double glazing	P	1	1397 x 1651	Slider Double glazing	P	1	686 x 782	Slider Double glazing	P					Good
F	4	813 x 813	Fixed glazing Slider Doubleglazing	P	1	1422 x 1372	Slider Double glazing	P	1	660 x 660	Slider Double glazing	G					Good
G	2	711 x 787	Slider Double glazing	P	1	483 x 914	Slider Double glazing	P	3	1067 x 1067	Slider Double glazing	P	1	1920 x 813	Fixed glazing Single hung	P	Poor
H	1	838 x 813	Slider Double glazing	P	1	914 x 1194	Fixed glazing Double glazing	P	1	838 x 914	Slider Double glazing	P					Good

Note: W/S - Weatherstripping
G - Good
P - Poor

continued...

TABLE 6.0 WINDOW SCHEDULE cont'd

Bldg. Group	WINDOW SCHEDULE																Sill/ Frame Condition
	TYPE - 1				TYPE - 3				TYPE - 3				TYPE - 4				
	#	Size (mm)	Style	W/S	#	Size (mm)	Style	W/S	#	Size (mm)	Style	W/S	#	Size (mm)	Style	W/S	
I	3	711 x 940	Single hung Aluminum storm	G	1	2261 x 1346	Single hung Aluminum storm	P	1	711 x 965	Single hung Aluminum storm	G	1	711 x 864	Single hung Aluminum storm	G	Good
J	3	737 x 1143	Slider Double glazing	P	1	660 x 1143	Slider Double glazing	P	1	737 x 787	Slider Double glazing	P	1	1829 x 1194	Fixed glazing Double glazing	P	Poor
K	3	813 x 508	Slider Double glazing	P	1	686 x 686	Slider Double glazing	P	1	1397 x 1651	Fixed glazing Slider Double glazing	P					Good
L	2	1587 x 787	Slider Double glazing	P	3	1219 x 787	Slider Double glazing	P		914 x 483	Slider Double glazing	P					Good

COMMENTS: This window schedule serves as a record of the existing installed windows in Attawapiskat. The data states the number of units per building, the size, the window type and the glazing.

Note: W/S - Weatherstripping
G - Good
P - Poor

TABLE 7.0 DOOR SCHEDULE

DOOR SCHEDULE										
	MAIN ENTRY					SECONDARY ENTRANCE				
Bldg. Group	Door Size	Door Type	Storm Door	Enclosed Porch	Weatherstripping Condition	Door Size	Door Type	Storm Door	Enclosed Porch	Weatherstripping Condition
A	813 x 2032	Metal clad insulated	No	Yes	Poor	813 x 2032	Metal clad insulated	No	No	Poor
B	813 x 2032	Metal clad insulated	No	Yes	Poor	813 x 3032	Metal clad insulated	No	No	Poor
C	813 x 2032	Wood, hollow core	Yes	No	Poor	813 x 2032	Wood, hollow core	Yes	No	Poor
D	813 x 2032	Wood, solid core	No	Yes	Poor	813 x 2032	Wood, solid core	No	No	Poor
E	813 x 2032	Wood, solid core	No	No	nil	813 x 2032	Wood, solid core	No	No	nil
F	813 x 2032	Wood, solid core	No	Yes	nil	813 x 2032	Metal clad insulated	No	No	nil
G	813 x 2032	Wood, solid core	No	Yes	nil	813 x 2032	Wood, solid core	No	No	nil
H	813 x 2032	Wood, solid core	No	Yes	nil		n/a			
I	813 x 2032	Wood, hollow core	Yes	Yes	nil	813 x 2032	Wood, solid core	Yes	No	nil
J	813 x 2032	Wood, solid core	No	No	nil	813 x 2032	Wood, solid core	No	No	nil
K	813 x 2032	Metal clad insulated	Yes	No	Poor	813 x 2032	Metal clad insulated	Yes	No	Poor
L	813 x 2032	Wood, hollow core	No	Yes	nil	813 x 2032	Wood, hollow core	No	No	nil

COMMENTS: This door schedule identifies the type of exterior doors used on the different housing units and states whether the house has a storm door or an enclosed porch.

3.3 Residential, Commercial and Institutional Infrared Inspection Results

The following commercial and institutional buildings were inspected with infrared thermography:

- The Band Council Building
- The School
- The Teachers' Residence
- The Nurses' Residence
- The James Bay General Hospital (Attawapiskat Wing)

The intent of the thermographic surveys was to identify thermal weaknesses that are contributing to increased heat loss through the building envelopes.

The infrared inspections took place during the evenings of April 9, 10 and 11.

3.3.1 General Infrared Evaluation Guidelines

Infrared thermography enables us to study the thermal performance of building envelopes without opening up walls and ceilings. Thermograms or thermal images, record the temperature variations of the building surfaces that are being inspected. The invisible, natural radiant energy emitted from objects produces these heat pictures.

On blue and white thermograms light shades indicate warmer temperatures, while darker shades represent progressively colder temperatures.

By carefully interpreting thermal images, much can be learned about a building's heat loss characteristics. Common building and insulation defects, such as missing, poorly installed or wet insulation, cause unnatural surface temperature variations on floors, walls or ceilings. Thermography pinpoints damaged insulation, insulation voids and air leakage.

During the inspection of the buildings in Attawapiskat, some temperature measurements were made to assist in the evaluation of the thermal images.

Next to each thermogram is the corresponding data collected at the time of the survey:

T_o - the outside ambient air temperature

RH_o - the relative humidity outside

T_i - the inside ambient air temperature

RH_i - the relative humidity inside

The temperatures recorded at the time of the survey were:

Interior Temperature 21.0°C
(Avg. Bldg. Int. Temp.)

Exterior Temperature -2.0°C

which created approximately 23 °C temperature difference between the interior and exterior. This temperature span is appropriate for a proper infrared scan.

The equipment utilized for the inspections was an AGA 750 Thermovision unit, capable of resolving temperature differences down to 0.1 °C. Thermograms were taken to document the areas of interest. Standard colour photos were also taken to reference the locations of the thermal images.

3.3.2 Residential Infrared Images

Several homes were inspected from the exterior to help categorize the residential buildings into similar building groups. Representative thermograms have been included to display the heat loss characteristics of houses on Lot # 191-E, 469-M and 532-C.

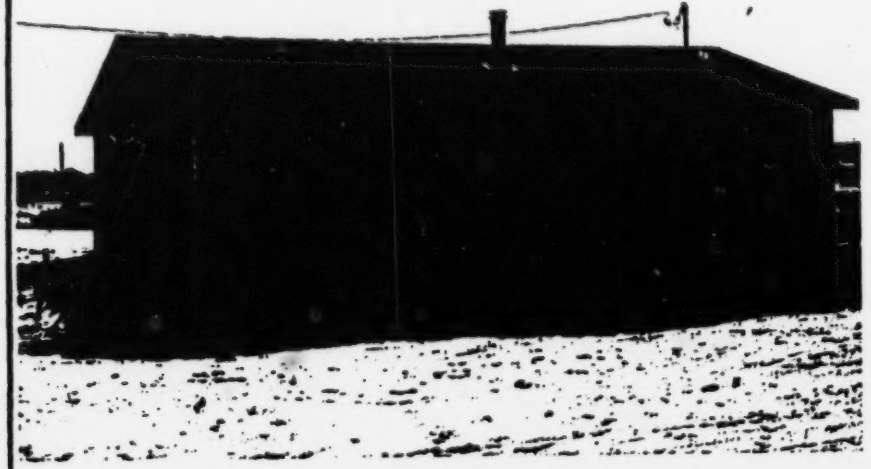


Image Number

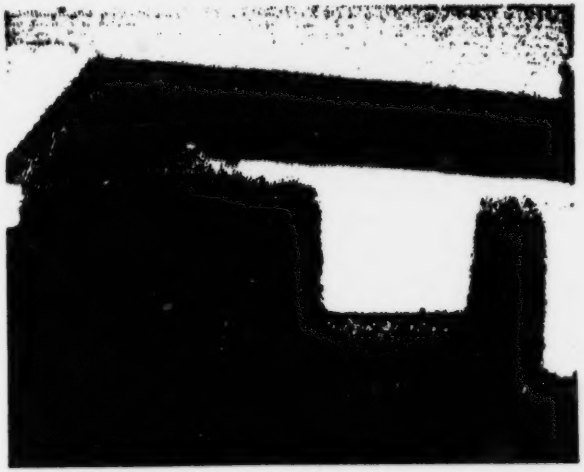
Location 191 E

T_o -2.0°C T_i 19.5°C

RH_o _____ RH_i _____

Comments:

This thermal image reveals that this home is uniformly insulated and free of major air leakage concerns. It is interesting to note that the temporary wooden cover on the lower portion of the front window has reduced the heat loss from this area.



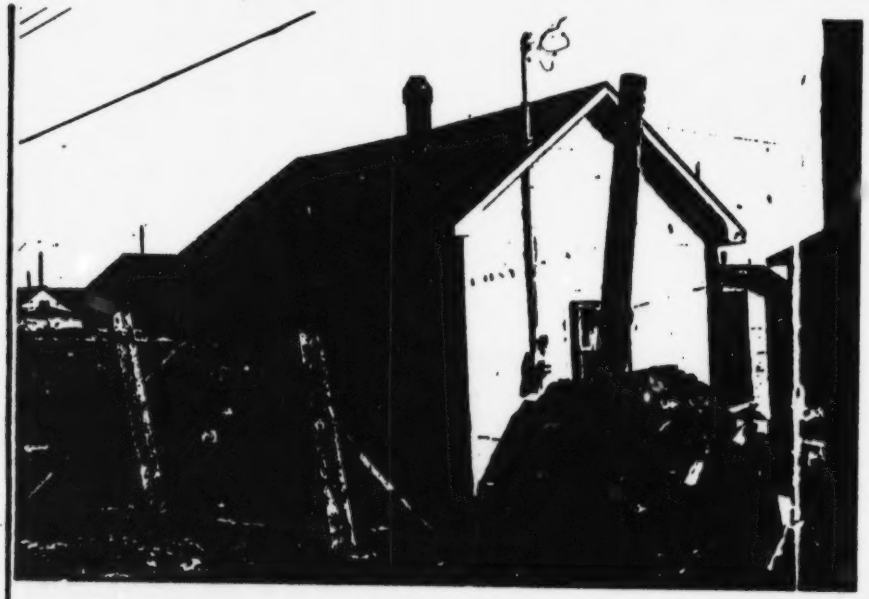


Image Number

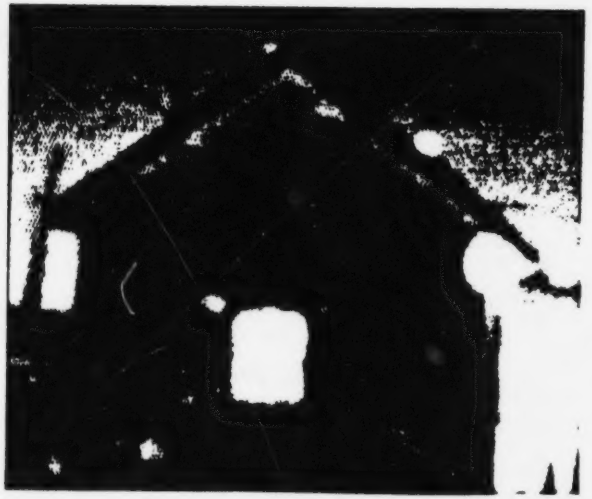
Location 469-M

T_o -2.0°C T_i 19.5°C

RH_o _____ RH_i _____

Comments:

Except for some points of air leakage, the light spots, this older home appears to be well insulated in the wall cavities. Discussions with local residents confirmed that the walls of this home are full of sawdust.



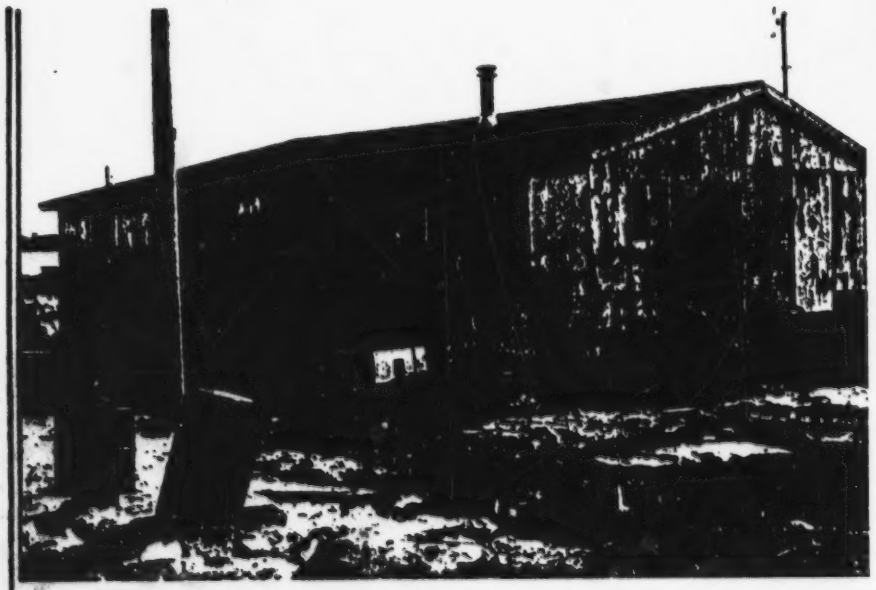


Image Number

Location 532-C

T_o -2.0°C T_i 19.5°C

RH_o _____ RH_i _____

Comments:

The uniform dark tones of the wall indicate that the wall insulation is working effectively. The gable end of the attic is quite warm - attic insulation needs to be upgraded to reduce this heat loss. Note the good fit of the new exterior door and the lack of air leakage around it.

3.3.3 Commercial and Institutional Infrared Images

The following pages show the thermographic images and diagnosis of the following buildings:

- The Band Council Building
- The School
- The Teachers' Residence
- The Nurses' Residence
- The James Bay General Hospital (Attawapiskat Wing)

Image Number 1.0

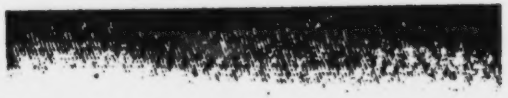
Location The Band Council Bldg. south elevation

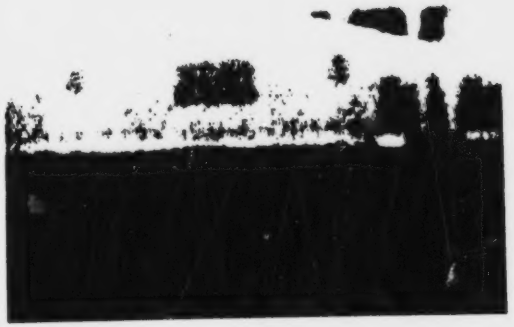
T_o -2.0°C T_i 19.5°C

RH_o - RH_i 28%

Comments:

This elevation has uniform thermal characteristics. Insulation is well placed and heat loss associated with air leakage is not a concern.





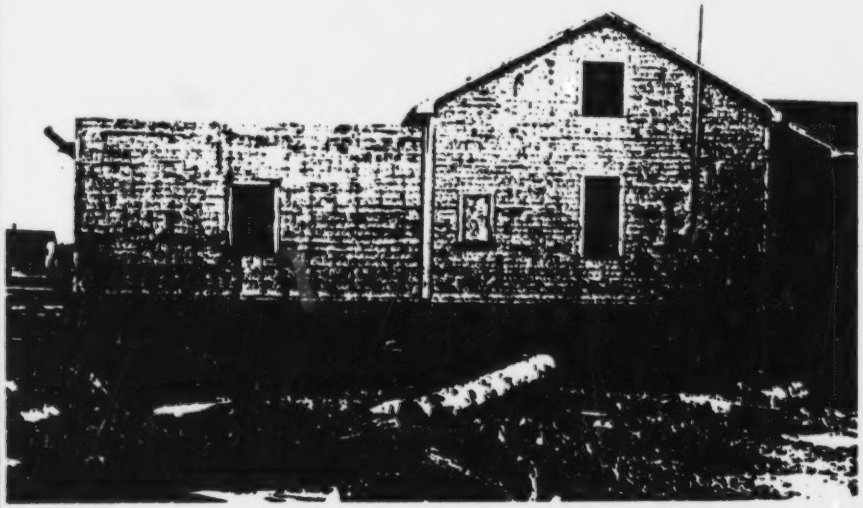


Image Number 2.0
Location The Band Council Bldg addition east elevation
T_o -2.0°C T_i 19.5
RH_o - RH_i 28%

Comments:
Thermal bridging or heat loss through structural framing components is quite evident in this structure. The matted appearance of the wall suggests that the insulation placement may not be uniform. If new siding is planned, additional rigid insulation behind the siding would help to resolve the thermal weaknesses of this structure.

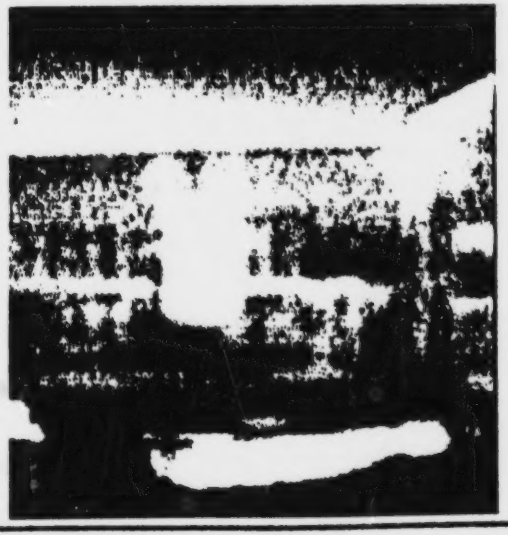


Image Number 3.0

Location The School south elevation

T_o -2.0°C T_i 21.°C

RH_o - RH_i -

Comments:

Except for minor irregularities the wall insulation is well placed. Some air leakage is evident around the window unit either between the glass and the frame or between the window frame and the wall. Some remedial caulking and sealing could reduce this air leakage.

43.

Image Number 4.0
Location The School south elevation

T_o -2.°C T_i 21°C

RH_o - RH_i -

Comments:

Insulation placement is quite uniform on these elevations. The warm spots on the image are a result of some air leakage at the intersection of structural components - this amount of air leakage is not abnormal for this type of structure.

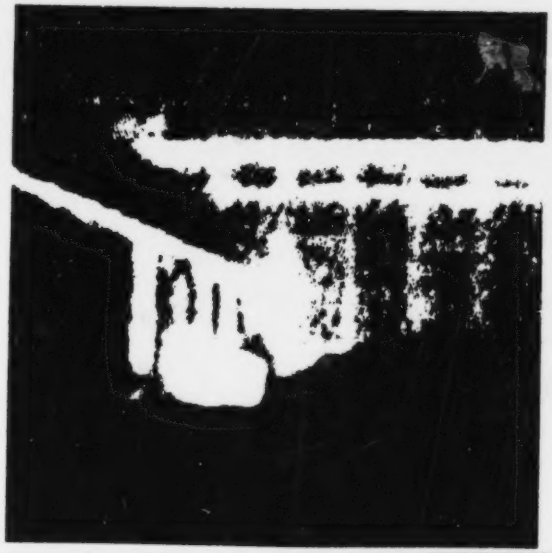
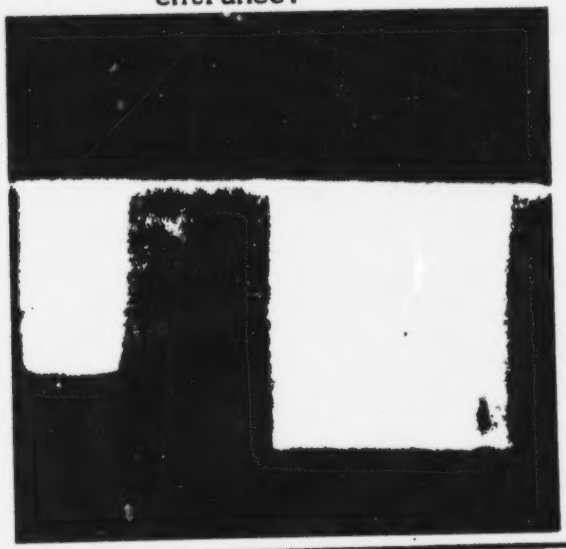


Image Number 5.0
The School
Location south entrance
T_o 2.°C T_i 21°C
RH_o - RH_i -

Comments:

Wall insulation in the building envelope is again well placed. The heat loss through and around the entrance doors is a result of the lower RSI value of the doors and some areas where the weatherstripping is poorly placed. Some weatherstripping adjustments or replacement are required for this entrance.



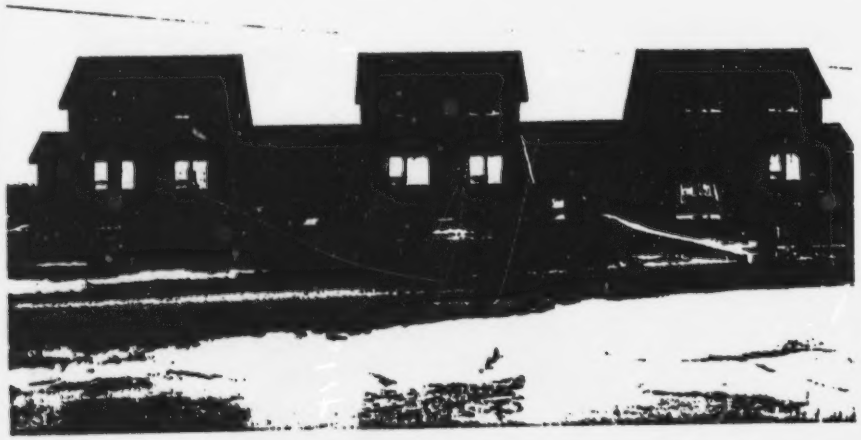


Image Number 6.0

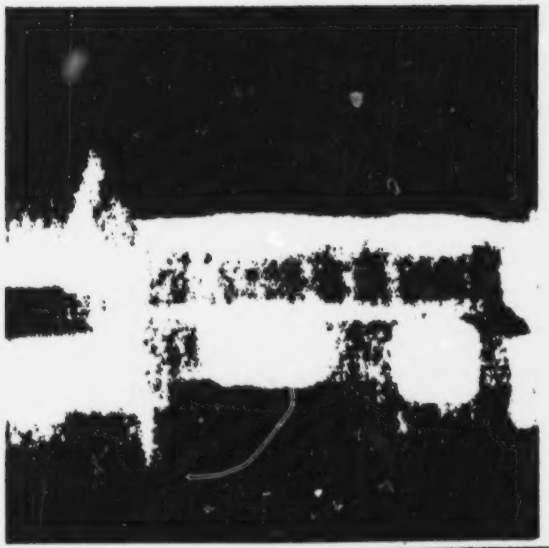
Location Teachers' Residence
south elevation

T_o 2.0°C T_i 21°C

RH_o - RH_i -

Comments:

The thermal integrity of these buildings is excellent. Note the lack of air leakage around the window units and the uniform wall patterns which indicate proper insulation placement.



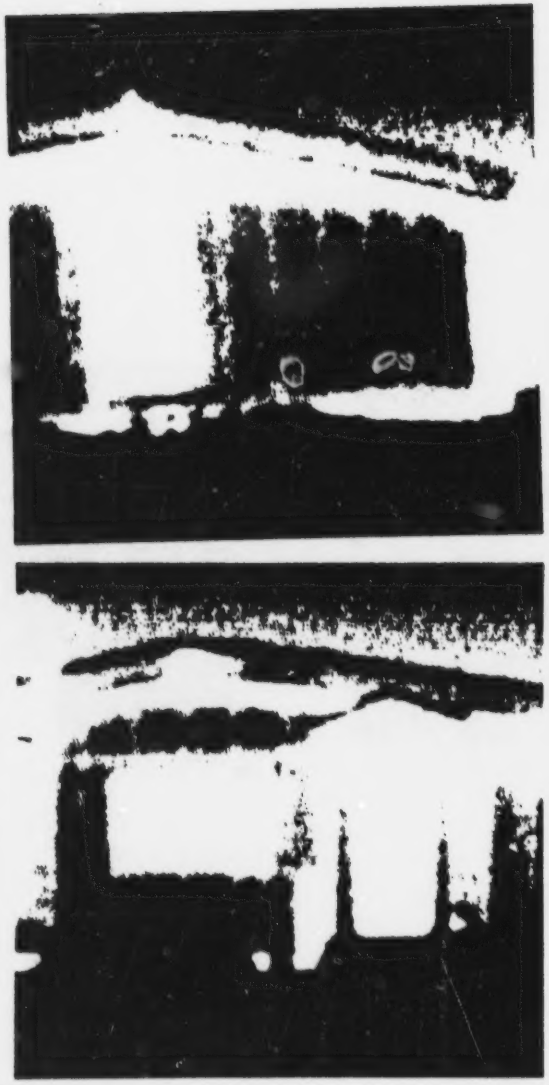


Image Number 7.0 & 8.0

Location Nurses`Residence
east and north elevations

T_o 2.0°C T_i 21°C

RH_o - RH_i -

Comments:

The warm spots along the underside of the roof pinpoint areas of air leakage. Some caulking and sealing in these areas could reduce this heat loss.

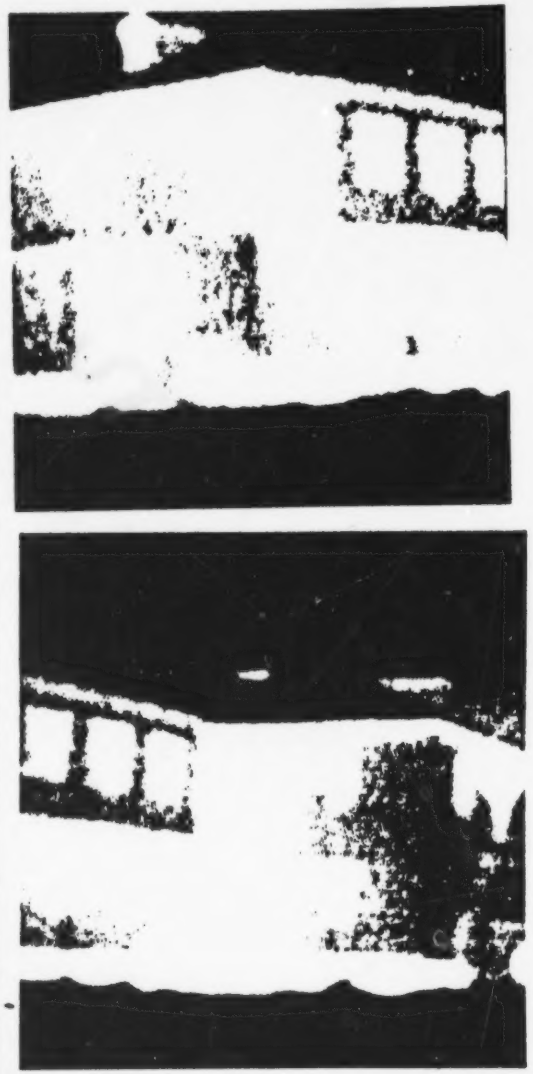


Image Number 9.0 &10.0

Location The James Bay General Hospital/Attawapiskat wing/south & south west elev.

T_o 2.0°C T_i 21°C

RH_o - RH_i -

Comments:

These thermal images reveal that one of the main building heat loss areas on this building is from the masonry foundation. Concrete has a low thermal RSI value and insulation applied to the interior or exterior of these foundation walls would be beneficial.

4. ENERGY DEMAND AND UPGRADING ANALYSIS

4.1 Building Data Analysis

The analysis consisted of a systematic review of the collected data on the current condition of typical houses and a review of slides for all houses and the identification of typical house categories, where the greatest number of various problems occurred.

4.1.1 Insulation Levels

Existing wall insulation levels indicate that the wall cavities are full in all typical houses and the insulation material is fibreglass batts (6" and 4", RSI 3.4 and 2.1, respectively). The existing level of wall insulation is adequate, unless there is an opportunity to add extra insulation through exterior retrofit of new siding.

Attics are generally under-insulated and present a cost-effective and easy energy upgrade option, since attic spaces are accessible.

During the review of floor insulation levels, it was found that four typical house categories did not have any insulation (F, G, J, L). The remaining had 6" - 2" of fibreglass batts.

In order to add floor insulation, most houses would have to be jacked-up to provide access.

4.1.2 Exterior Condition

At present, most of the typical houses are standing on wood blocking; too close to the ground to gain access to the underside of the house.

Generally, roofs and soffits were found in good condition, with the exception of building groups C and E, where some sagging was observed.

Most of the newer housing units have vinyl exterior siding in good condition. However, the older houses have painted plywood cladding which is in very poor condition with paint peeling and blistering in evidence. The general tightness was found to be poor and caulking around doors and windows is nonexistent in most cases.

4.1.3 Interior Condition

The interior inspection showed that walls have prefinished wood panels in good condition in about 50% of the typical houses. Tiled ceilings are common, but some houses have plywood or fibreboard ceilings.

The condition of the ceilings has been found to be poor in many houses.

All typical houses have full attics with attic vents.

The observed interior problems - ceiling stains, dust marks, mildew, bulging walls and collapsing ceilings indicated severe problems with excessive humidity, air leakage, heat loss as well as structural instability in many houses. Some problems would be linked directly to the low level of insulation; for example, house Type J has an attic insulation level of 0.87 RSI and ceiling dust marks throughout the house, indicating convection currents and excessive heat loss through the ceiling. The most typical comfort-related problems mentioned by the tenants were low floor-temperature and drafty doors and windows. Low floor-temperature could be caused by lack of insulation combined with cold air leaking through the baseboard; both were identified as typical problems for most houses.

4.1.4 Windows and Doors

The predominant window type was found to be double glazed slider, in most cases, with poor or nonexistent weatherstripping.

Three types of doors are being used; newer houses (categories A, B, C, K) have metal clad, insulated doors. Older houses have solid wood or hollow wood doors (categories

C, I & L). Some houses had storm doors, or enclosed, unheated porches. Weatherstripping is either poor or nonexistent in all typical houses; this is probably the major cause of the tenants' complaints about drafty doors.

4.1.5 Heating System

All of the typical houses are wood heated (most have HEVAC WC-100 wood stoves) only three (3) houses were identified having oil space heaters.

In summary, it appears that a significant potential exists for energy conservation through the implementation of appropriate upgrade measures. It is important to note that the maintenance of structural stability and integrity of houses is a necessary pre-requisite to the overall success of energy conservation upgrade measures. Precautionary comments are included with the description of each of the upgrade measures in the following section 4.3.

4.2 Existing Energy Demand

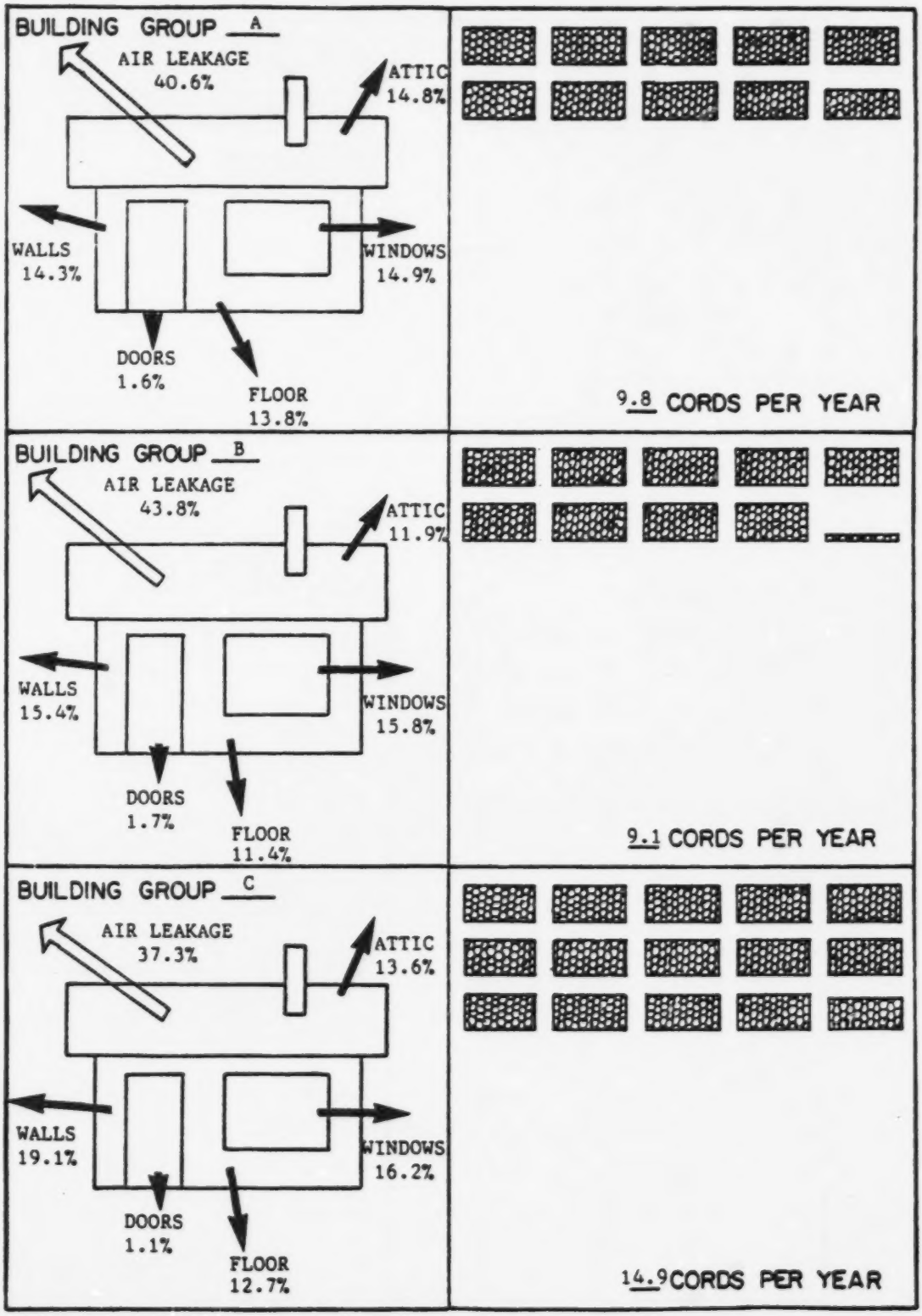
Based on the measurements and observations obtained during the detailed housing inspections, the existing energy demands of typical housing units in the twelve (12) representative building groups were calculated.

Graphic summaries of the heat loss characteristics of the various homes in Attawapiskat are presented on the following pages.

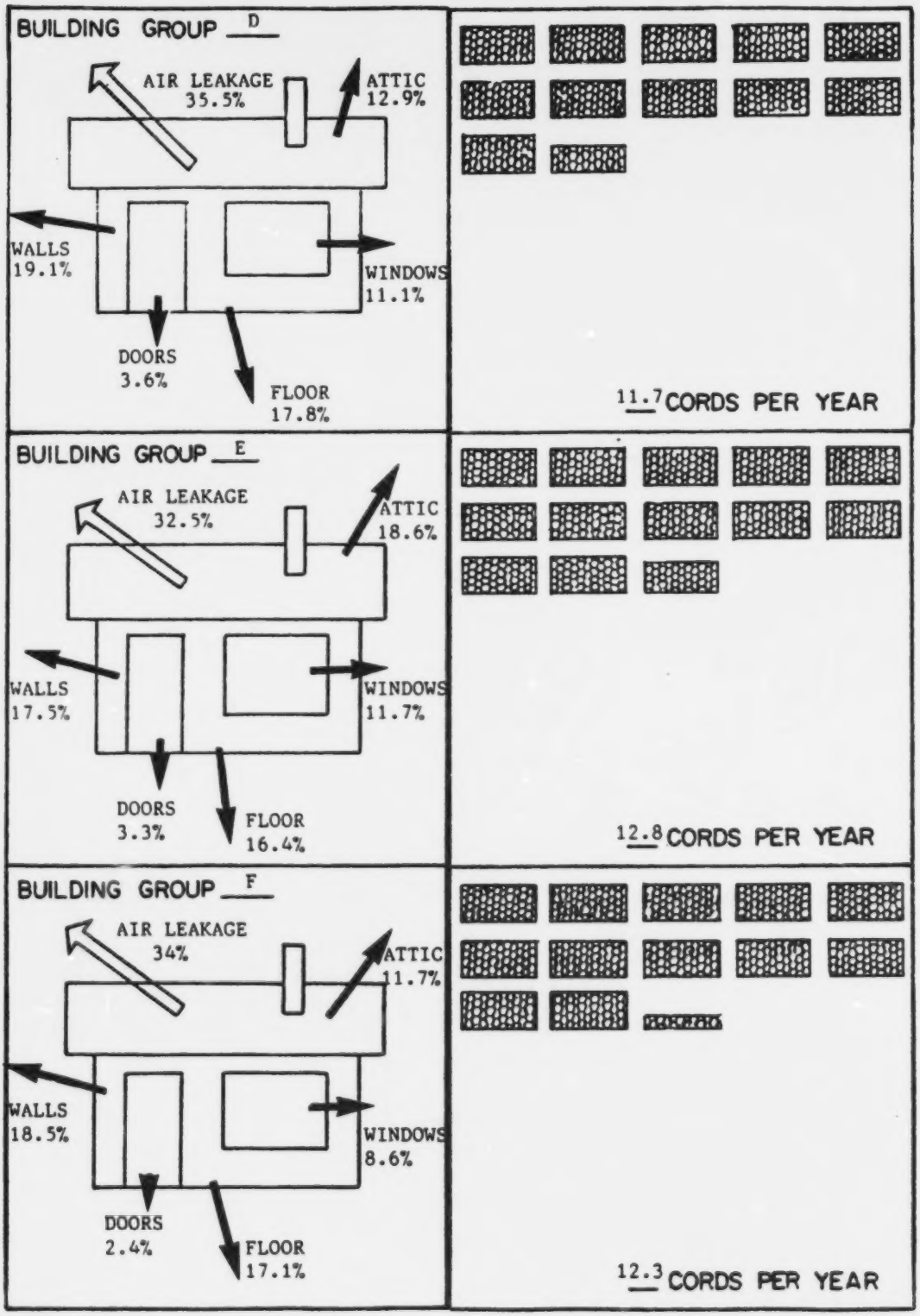
The arrows on the house sketches are proportioned in length according to the amount of heat loss through the building components. The largest energy losers are readily obvious.

The estimated annual fuel consumption, displayed in cords per year, is also helpful. The houses with the highest consumption per year are the ideal candidates for energy upgrade modifications.

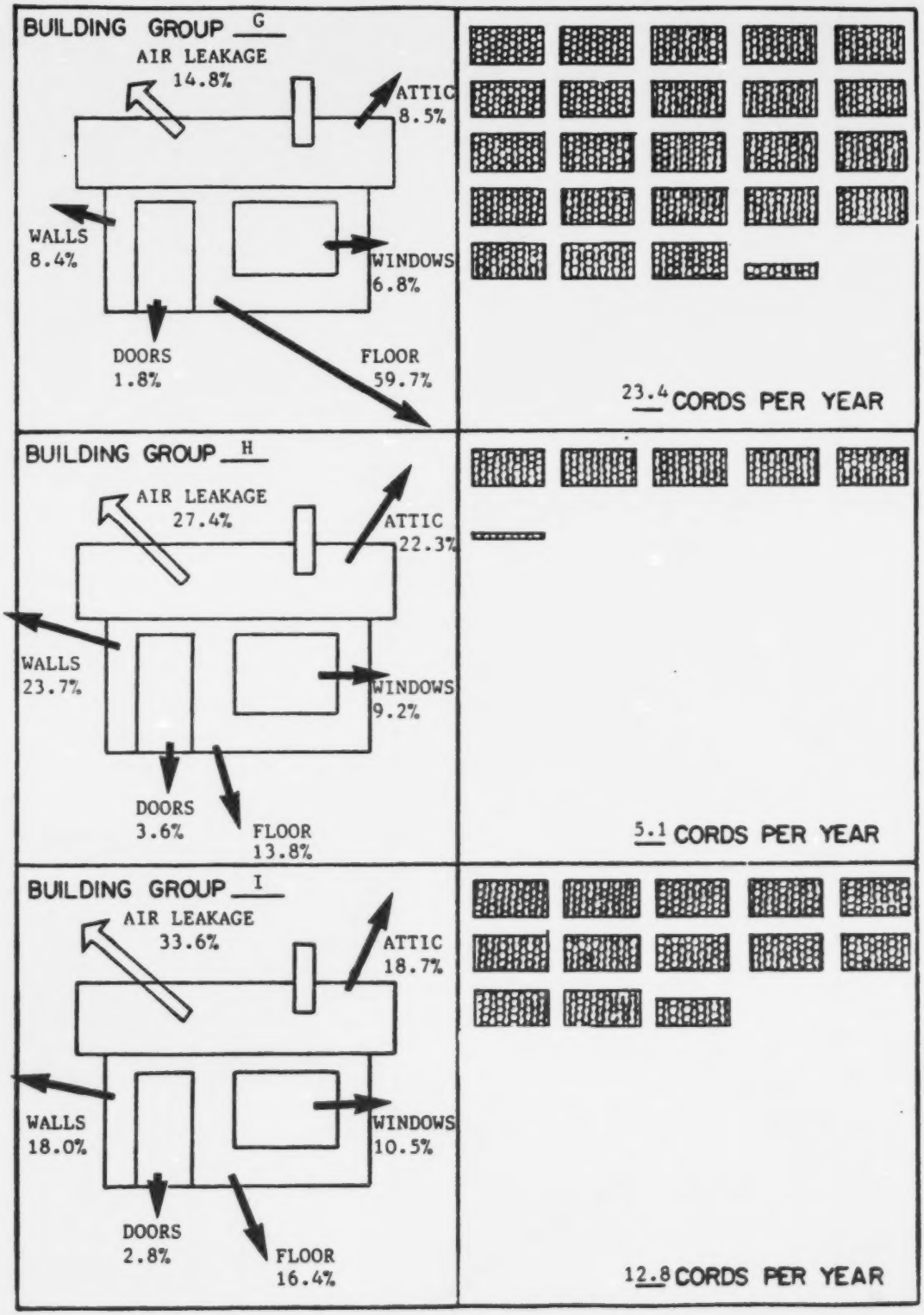
ATTAWAPISKAT
HEAT LOSS SUMMARY



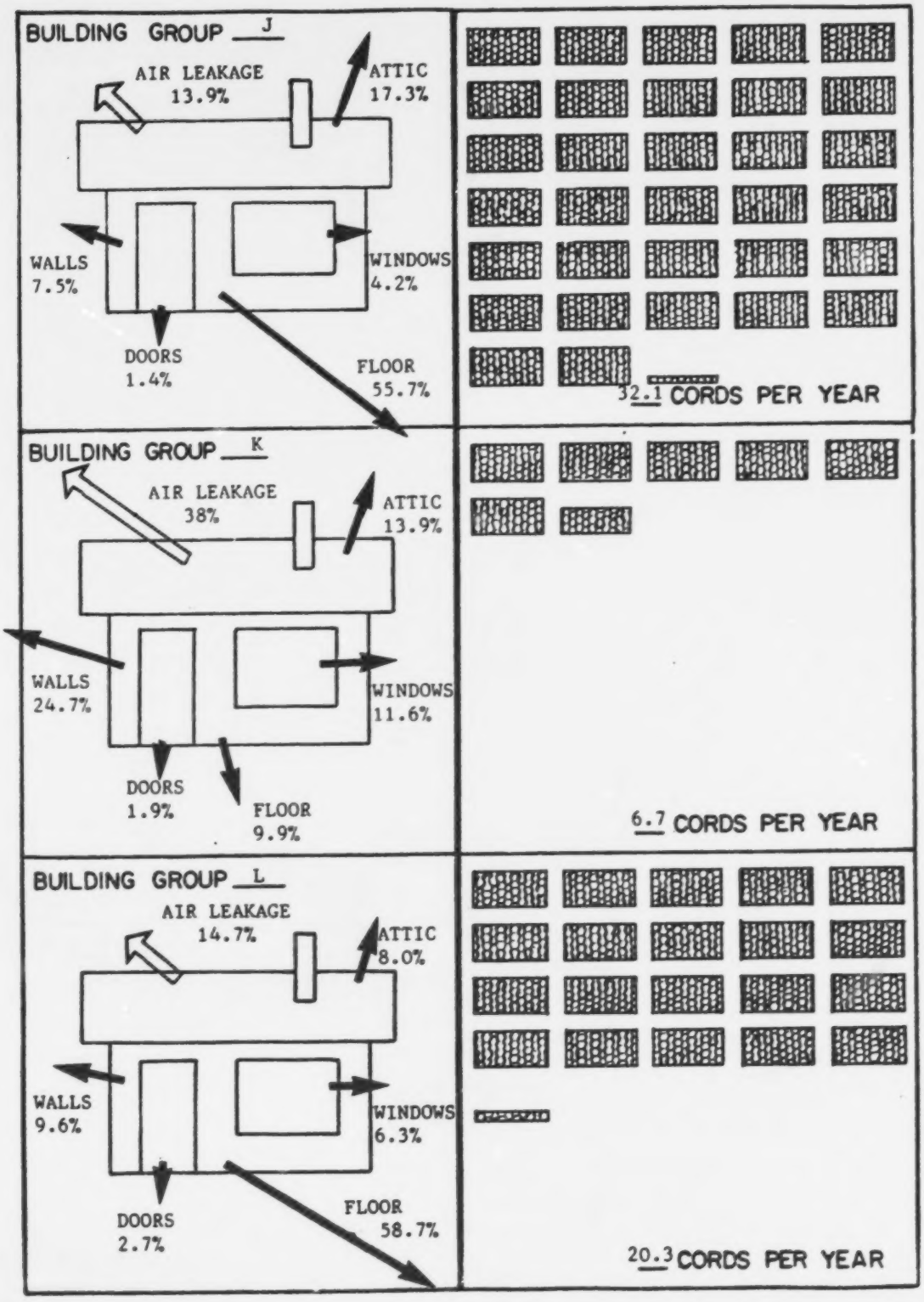
ATTAWAPISKAT
HEAT LOSS SUMMARY



ATTAWAPISKAT
HEAT LOSS SUMMARY



ATTAWAPISKAT
HEAT LOSS SUMMARY



4.3 Potential Upgrade Measures

Based on the building data analysis and existing energy demands, several potential upgrade measures have been identified that are well suited to remedy the energy weaknesses in Attawapiskat.

The potential energy conservation measures (ECM) are:

ECM 1: Wall Retrofit - Exterior Application
ECM 2: Wall Retrofit - Interior Application
ECM 3: Attic Insulation
ECM 4: Floor Insulation
ECM 5: Air Tightening Walls
ECM 6: Improve Heat Distribution
ECM 7: Window Replacement
ECM 8: Interior Storm Windows
ECM 9: Weatherstrip Windows
ECM 10: Storm Door
ECM 11: Insulated Door Cover
ECM 12: Metal Clad Insulated Door
ECM 13: Weatherstrip Doors

Each energy conservation measure has costs associated with it. The "Total Installed Cost" is an estimate of the cost of the materials, transportation from Kapuskasing to Attawapiskat, and labour to install the option.

The costs are based on one of the more common house sizes, being 11.0 m by 7.4 m. Some of the energy conservation measures would cost more or less depending on the particular size of the house.

UPGRADE MEASURE: ECM1: Wall Retrofit - Exterior Application

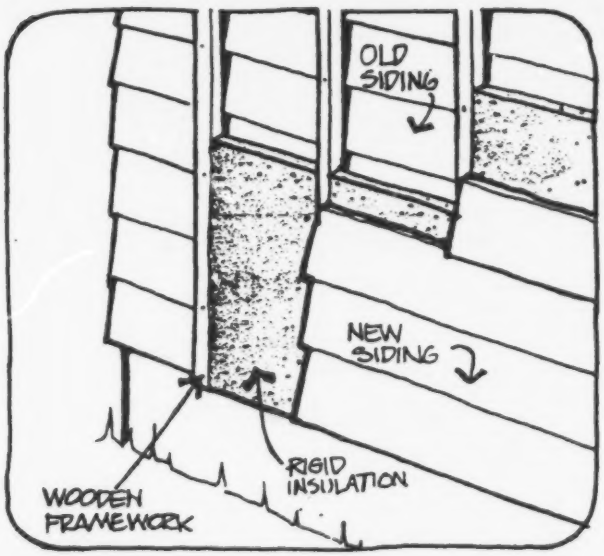
PREREQUISITES:

. Exterior siding in poor condition.

. Wall RSI value not up to recommended levels (below 2.1 RSI value).

DESCRIPTION

Rigid, fibreglass insulation panels are secured with strapping to the outside surface of the exterior walls. Vinyl siding is installed over the insulation.



RECOMMENDED MATERIALS:

. 38 mm thick "GLASCLAD" rigid insulation - 30 sheets, 1219 mm x 2743 mm.

. Horizontal vinyl siding and trim - 97 sq. m.

. 25 mm x 75 mm wood strapping - 365 m.

ESTIMATED INSTALLED COST:

Materials:	$1,900
Labour:	1,600
Transportation:	500
Total	$4,000

UPGRADE MEASURE: ECM2: Wall Retrofit - Interior Application

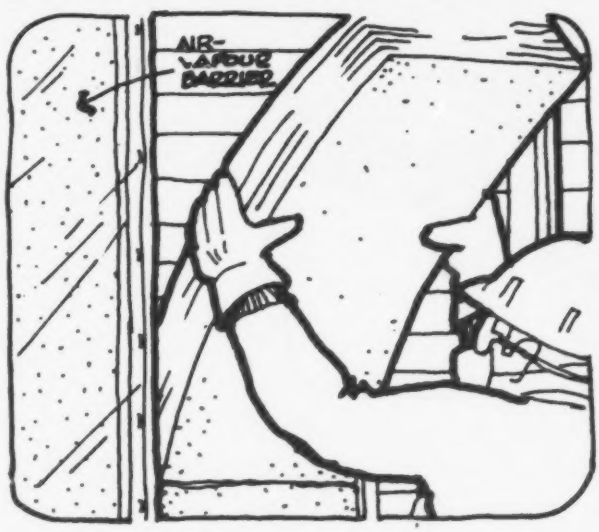
PREREQUISITES:

- Partially filled wall cavities.
- Interior finishes easily removed.
- Exterior cladding in good condition.
- Wall RSI value not up to recommended levels (below 2.1 RSI value).

DESCRIPTION:

The prefinished plywood panels on the inside of the exterior walls are carefully removed (to be reinstalled). The polyethylene vapour barrier (if there is one) is removed, extra fibreglass batt insulation is installed and a new polyethylene vapour barrier is installed and caulked. The prefinished wall panels are then reinstalled.

BATT OR BLANKET TYPE INSULATION



RECOMMENDED MATERIALS:

- Fibreglass batt insulation - friction fit, 16 bundles, RSI 2.1.
- Four mil polyethylene vapour barrier, 1140 sq.m. roll.
- Butyl caulking, 10 tubes.

ESTIMATED INSTALLED COST: (per house)		
	Materials:	$450
	Labour:	650
	Transportation:	100
	Total	$1,200

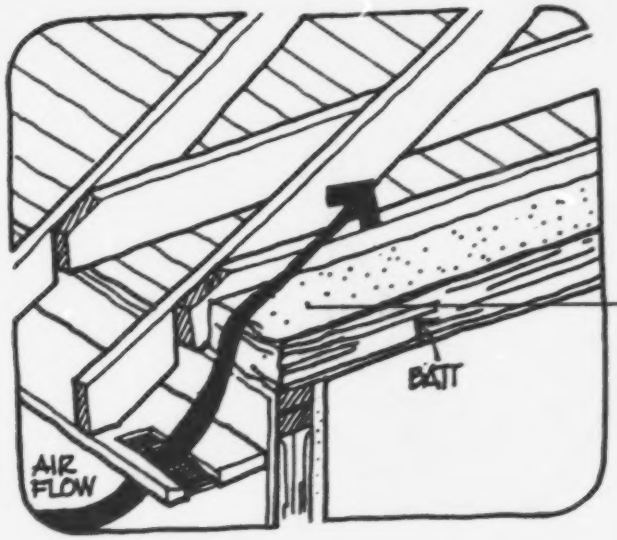
UPGRADE MEASURE: ECM3: Attic Insulation

PREREQUISITES:

. Attic insulation does not meet recommended levels (below 5.6 RSI value).

DESCRIPTION:

Friction fit fibreglass batts are spread out between the ceiling joists. The attic hatch is insulated with rigid insulation. Additional attic vents are installed on the roof. Insulation depressers are installed in the attic at the eaves to prevent the soffit vents from being blocked by the new insulation.



RECOMMENDED MATERIALS:

. Fibreglass batts - friction fit.

RSI - 4.9 - 24 bundles
RSI - 3.5 - 18 bundles
RSI - 2.1 - 10 bundles

. "GLASCLAD" rigid insulation - 38 mm, 1 sq. m.

. Insulation depressors - 6.

. Hardboard - 3.2 mm, 2 sq. m.

. Roof vents - 2.

ESTIMATED INSTALLED COST:

	RSI 4.9	RSI 3.5	RSI 2.1	RSI 1.0
Materials	$550.	$375.	$210.	$90.
Labour	125.	125.	125.	75.
Transportation	175.	150.	75.	35.
Total	$850.	$650.	$410.	$200.

UPGRADE MEASURE: ECM4: Floor Insulation

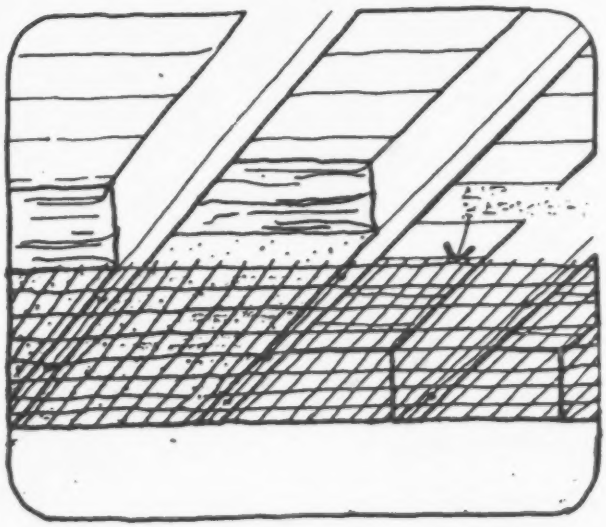
PREREQUISITES:

. Floor insulation does not meet recommended levels (below 4.6 RSI value).

. Access to underside of house is necessary.

DESCRIPTION:

From under the house, fibreglass batt insulation is installed between the floor joists. After the joist cavity is fully insulated, a vapour permeable air barrier sheet is stapled to the underside of the joists.



RECOMMENDED MATERIALS:

. Fibreglass batt insulation -

RSI - 4.9 - 24 bundles
RSI - 3.5 - 18 bundles
RSI - 2.1 - 10 bundles

. Tyvek air barrier - 80 sq. m.

ESTIMATED INSTALLED COST:

	RSI 4.9	RSI 3.5	RSI 2.1	RSI 1.0
Materials	$625.	$500.	$300.	$90.
Labour	125.	125.	125.	75.
Transportation	200.	125.	75.	35.
Total	$950.	$750.	$500.	$200.

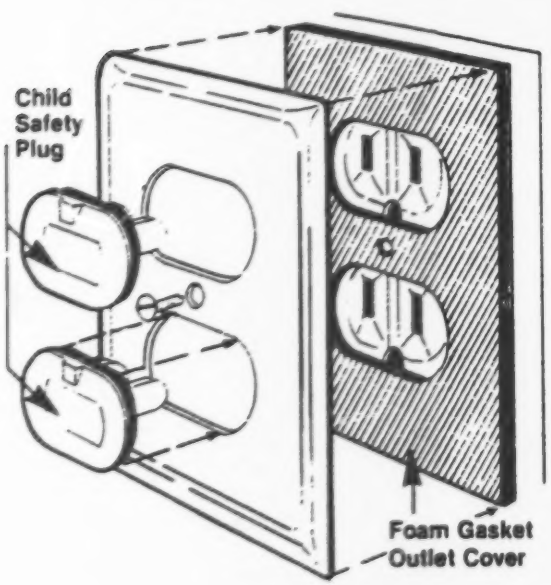
UPGRADE MEASURES: ECM5: Air Tightening Walls

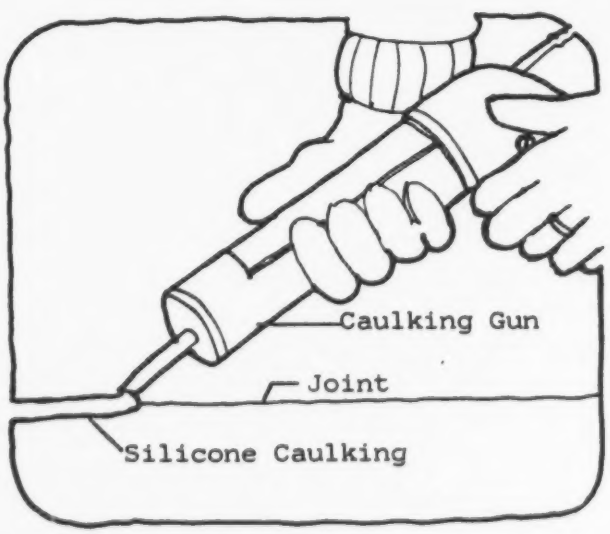
PREREQUISITES:

. House is noticeably drafty at floor/wall intersections and at electrical outlets.

DESCRIPTION:

Small cracks in the exterior walls, floors and ceiling are sealed using silicone caulking. Larger gaps are stuffed with a compressible foam rope. Gaskets are installed behind the cover plates of wall outlets, switches, etc. to reduce air leakage.





RECOMMENDED MATERIALS:

. Silicone caulking - 10 tubes.
. Ethafoam rope - 40 m.
. Electrical outlet gaskets - 3 packages.

ESTIMATED INSTALLED COST: (per house)

Materials	$130.
Labour	85.
Transportation	10.
Total	$225.

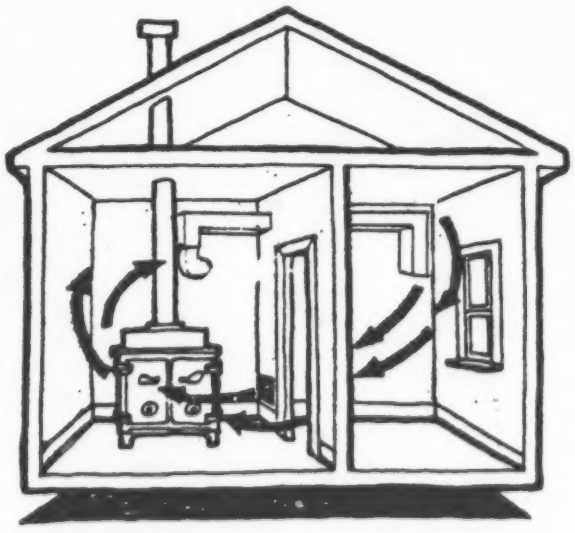
UPGRADE MEASURE: ECM6: Improve Heat Distribution

PREREQUISITES:

. Uneven heat distribution.

DESCRIPTION:

The hot air in the room containing the wood stove is dispersed to other rooms by means of ductwork and an electrically operated blower.



RECOMMENDED MATERIALS:

. Electric blower - designed to suit.
. Metal duct.
. On/off switch.
. Wall grilles - to suit duct size.

ESTIMATED INSTALLED COST: (per house)

Materials	$400.
Labour	225.
Transportation	75.
Total	$700.

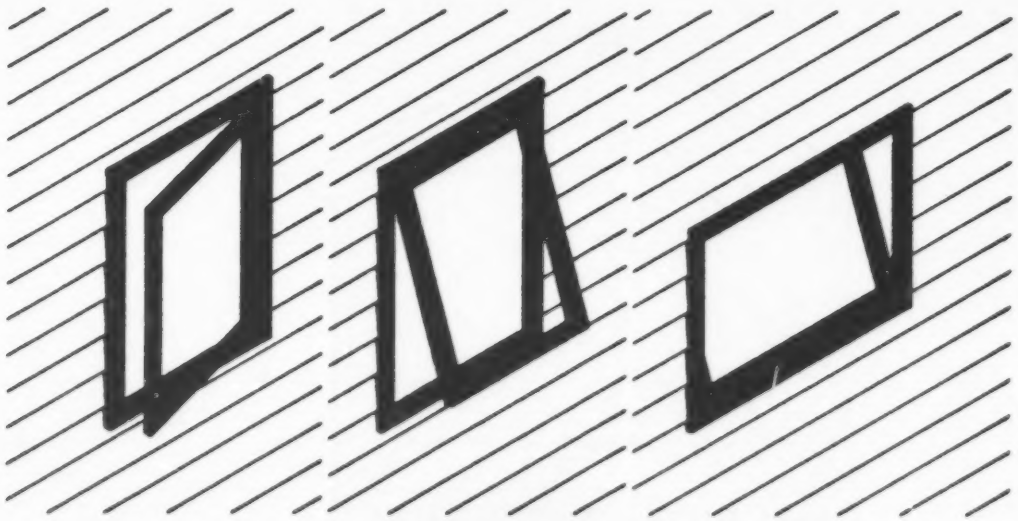
UPGRADE MEASURE: ECM7: Window Replacement

PREREQUISITES:

. Existing window damaged beyond repair (twisted, broken frame).

DESCRIPTION:

Replace existing window with a new window.



Preferred openable window types

RECOMMENDED MATERIALS:

. Replacement double glazed window.

ESTIMATED INSTALLED COST:		
(per typical window: 813mm x 686mm)	Materials	$215.
	Labour	75.
	Transportation	10.
	Total	$300.

UPGRADE MEASURE: ECM8: Interior Storm Windows

PREREQUISITES:

. Single glazed or drafty window units.

DESCRIPTION:

Over the inside of the window, attach a plexiglass panel for use during the winter.

RECOMMENDED MATERIALS:

. Plexiglass or plastic sheeting.

. Magnetic channel moulding or tape.

ESTIMATED INSTALLED COST:

(per house)

. Based on 7 windows per house.

. Average size - 813 mm x 686 mm.

Materials	$115.
Labour	80.
Transportation	30.
Total	$225.

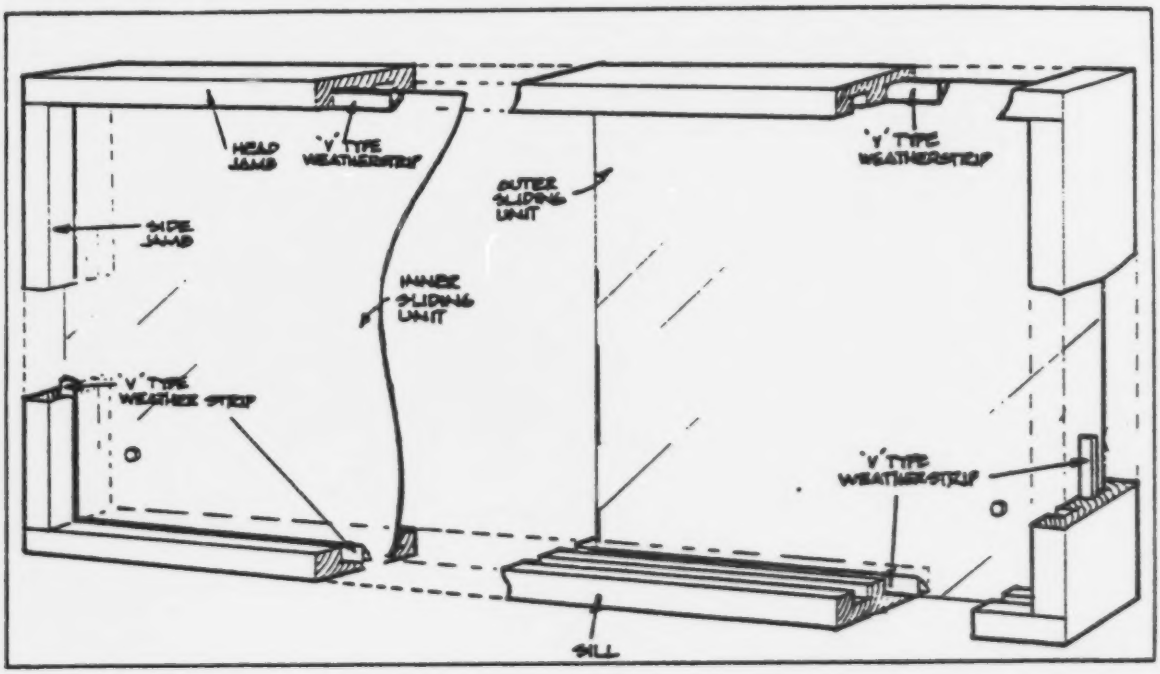
UPGRADE MEASURE: ECM9: Weatherstrip Windows

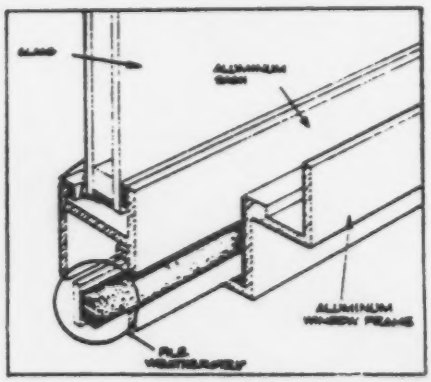
PREREQUISITES:

. Windows are drafty or lack weatherstripping.

DESCRIPTION:

Install V-strip or pile weatherstripping to reduce air leakage. Caulk from the inside where the window frame meets the wall.





RECOMMENDED MATERIALS:

. V-strip or pile weatherstripping - 10 packages.

. Silicone caulking - 4 tubes.

ESTIMATED INSTALLED COST:

(per house)

. Average of 7 windows per house.

Materials	$100.
Labour	80.
Transportation	20.
Total	$200.

UPGRADE MEASURE: ECM10: Storm Door

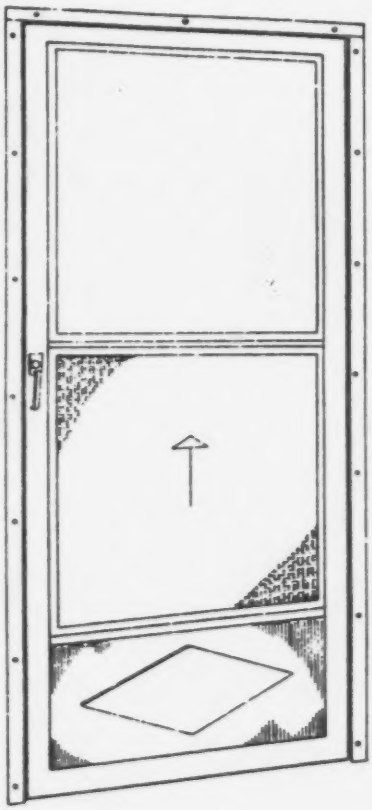
PREREQUISITES:

. No cold porch.

. Main entrance.

DESCRIPTION:

Install storm door on the main entrance.



RECOMMENDED MATERIALS:

. 50 mm storm door.

ESTIMATED INSTALLED COST: (per door)

Materials	$215.
Labour	35.
Transportation	15.
Total	$265.

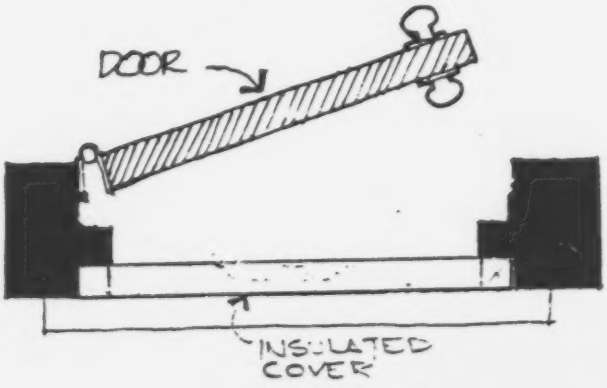
UPGRADE MEASURE: ECM11: Insulated Door Cover

PREQUISITES:

. Unused secondary entrance.
. Poor weatherstripping.
. Wood secondary door.

DESCRIPTION:

At those exterior door openings which are not used, an insulated panel is installed.



RECOMMENDED MATERIALS:

. 38 mm "GLASCLAD" rigid insulation - 1.7 sq. m.
. 2" x 2" spruce - 5.8 m.
. 1/8" hardboard (exterior grade) - 1.7 sq. m.
. V-strip weatherstripping - 1 door package.
. Hardware (to hold panel in place).

ESTIMATED INSTALLED COST: (per door)

Materials	$40.
Labour	30.
Transportation	5.
Total	$75.

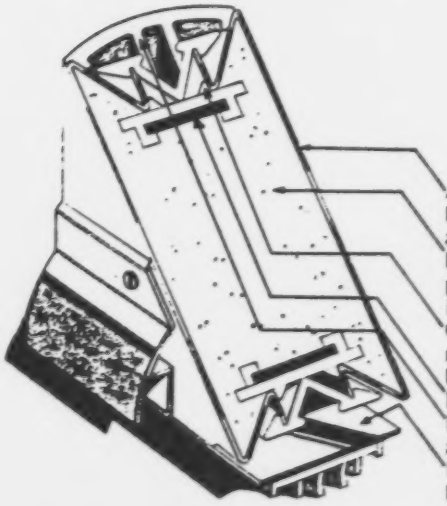
UPGRADE MEASURE: ECM12: Metal Clad Insulated Door

PREREQUISITES:

. Main door(s) into the house is hollow type or is damaged beyond repair.

DESCRIPTION:

Replace entrance doors into the house with a metal clad insulated door and frame.



A. Heavy guage panels of cold-rolled steel for life-long flatness and stability. Zinc-coated, bonderized and prime-painted ready for your choice of finish.
B. Rigid, featherlight insulating core of foamed-in place polyurethane immovably bonded to all inside facings.
C. Returned facing panels locked in place with a rigid vinyl extrusion to provide a positive thermal break. *Patented Thermo Break System.
D. 14 guage galvanized steel stabilizing member.
E. Snap-in extruded vinyl edge cap to complete top and sides of door.
F. Flexible vinyl sill sweep seals onto the thermal break built into an extruded aluminum threshold.

RECOMMENDED MATERIALS:

. Metal clad insulated door and frame.

ESTIMATED INSTALLED COST: (per door)

Materials	$300.
Labour	145.
Transportation	25.
Total	$470.

UPGRADE MEASURE: ECM13: Weatherstrip Doors

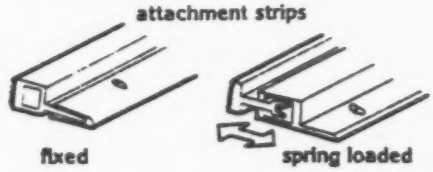
PREREQUISITES:

. Doors are drafty.

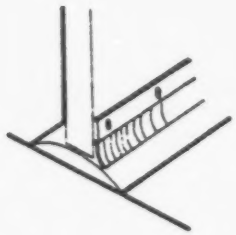
. Weatherstripping is in poor condition or nonexistent.

DESCRIPTION:

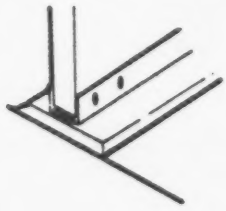
Remove existing weatherstripping and replace with a spring loaded weatherstripping.

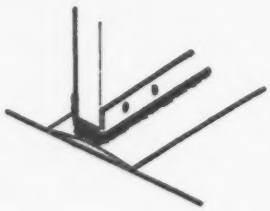


Door Sweeps:
This type is installed on the hinge side of the door. Generally, a vinyl or rubber sweep seals at the threshold. Look for a slotted screw hole that can be adjusted. Some types have a polyester pile while others have a hinged sweep that can be used on uneven floors.



Door Bottoms:
This type slides over the door bottom. There is usually a vinyl bulb or pile strips which seal against the threshold. A clearance of 8 to 13 millimetres (1/4 to 1/2 inch) over the threshold is required. This type has the advantage of being less susceptible to damage caused by traffic.





RECOMMENDED MATERIALS:

. Spring loaded door weatherstripping kit.

. Bottom door sweep.

ESTIMATED INSTALLED COST: (per door)		
	Materials	$35.
	Labour	20.
	Transportation	5.
	Total	$60.

5. ASSESSMENT OF LOCAL RESOURCES

During the site visit, several community officials were interviewed to identify the availability of and type of resources, both human and material, within or near the community. Local cost data pertaining to building materials, heating fuel procurement, transportation costs and sources of building materials were also obtained.

The Attawapiskat Band took over responsibility for housing in 1978; prior to that DIAND built about ten (10) units per year, handled through the Moose Factory office. DIAND started building the first houses in Attawapiskat in 1965.

A summary of the building activity over the past few years is summarized below:

1983 - 25 units built
1982 - 16 units built
1981 - 12 units built
1980 - 10 units built

Prior to 1980, the average was about 10 housing units per year. The approximate in-place cost for a house in 1983 was $38,000 of which approximately $24,000 represented material costs alone.

The oldest houses remaining in the community were built in the early 1960's with the exception of the old Hudson's Bay House which is now a "motel".

At this time, renovation which is carried out by the Band primarily involves simple recladding of the structures, inside and outside, with additions of some new doors and windows. Some units are also reinsulated. Houses that were built earlier than 1965 are not renovated - the Band has deemed that it is better to replace these units with new buildings.

The following data and information is included for general reference. This data has been used in the assessment of the energy upgrade potentials outlined.

5.1 Attawapiskat's Construction Labour Force

Currently, there are approximately thirty (30) people involved in the building process:

25 - carpenters
1 - electrician
1 - electrician assistant
2 - drivers

Carpenters are paid $10./hour; the electrician receives $11./hour; and the rate for general labour is about $8./hour. The average work week consists of five (5) days @ 8 hours/day.

5.2 Energy Information

5.2.1 Electrical Power

Ontario Hydro uses four (4) Caterpillar generators to produce roughly 877,836 KWh. The annual fuel oil consumption in 1981 was 92,055 gallons or 418,482 litres to run the generator.

The present charges for electricity to natives is $0.08/KWh for the first 250 KWh then $0.15/KWh, with a limit of a 20 amp service. Others in Attawapiskat pay $0.40 to $0.51/KWh.

5.2.2 Wood

Fire wood is used to provide nearly all of the space heating requirements for native housing. The community wood consumption in 1981 was estimated to be 1,600 cords per year. The wood resource potential is stated to be good for present consumption levels according to the Ministry of Energy's "Remote Community Data Base - Volume I - September 1982". An approximate value of $35. per face cord or $ 105. per full cord is allowed for firewood. Based on electricity costs in Attawapiskat, the converted value of a full cord of firewood is $248.

5.2.3 Fuel Oil

Fuel oil is used primarily for space heating in commercial and institutional buildings and for electrical power generation. The Roman Catholic Moosonee Diocese purchases all fuel oil used in the community since it has bulk storage facilities. The fuel oil is transported in bulk by barge from Moosonee in the Summer. Imperial Oil Ltd. in Moosonee is the supplier. In 1981, 158,119 gallons or 718,708 litres were shipped to Attawapiskat. Fuel oil costs roughly $2.40/gallon.

5.3 Building Materials

A wide variety of building materials are readily available on a year 'round basis from suppliers in Kapuskasing, Ontario. Building materials are generally flown into Attawapiskat via Austin Airways at a cost of approximately $0.30/pound. A full planeload consists of approximately 12,800 pounds of building materials.

6.0 SKILLS AND MATERIALS REQUIRED FOR UPGRADING

Based on site interviews with the Band Council and site observations of the construction activity, there are several Attawapiskat individuals who are well versed in residential construction techniques. These carpenters and their helpers could easily be trained to implement the energy upgrades.

A "Building Maintenance Manager", who is in charge of thermal upgrading, should be named by the Band Council to develop a schedule to train the people who will be involved in the work and to establish the priorities for material deliveries and subsequent retrofit activities. The Manager's duties would also include promoting the communities' awareness of energy conservation techniques to ensure that the upgrading activities continue on a directed basis from year to year.

The materials required for the thermal upgrades are virtually all readily available from existing construction material suppliers to Attawapiskat.

Some products such as inside storm windows, ethafoam rope and fans and ductwork would have to be purchased in the southern Ontario market, but these products are all light and durable and can easily be shipped to site.

Proper material control is essential during energy retrofits of this type. Material deliveries should coincide with the availability of trained personnel and the weather conditions should be suitable for the planned retrofit activities. Materials should be tagged prior to shipment with specific building group and lot number designations. This allows for quick delivery to each home and reduces lost or wasted materials.

For some of the materials, such as glues and caulking a proper interior storage area (possibly within the home that is to be repaired) should be designated to prevent the materials from freezing.

7.0 ENERGY UPGRADE RECOMMENDATIONS

7.1 Implementation Plan

In order to select applicable energy upgrade measures for each typical house category, the prerequisite for each measure was compared to the status of the house regarding level of insulation, air tightness, window type, weatherstrippng, etc.

Table 8.0 shows all the applicable measures and how they apply to the various building groups.

Using the heat loss analysis computer program and changing the RSI and air change values to reflect the upgrade measures the effect of the upgrade measure can be expressed in terms of reduced consumption of firewood or in number of full cords used.

Table 9.0 shows how consumption changes with the implementation of two types of measures; measures which increase the thermal resistance of the building shell - and those which help to reduce the heat losses due primarily to reduction of air changes per hour. Two levels of air changes are shown; it is assumed that high quality installation would result in the lower rate of air change.

Type #1 upgrade measures include those which will increase the thermal resistance of the house (insulation, interior storm windows,

insulated door cover, metal clad insulated door).

Type #2 upgrade measures include those which will decrease heat losses due to air change (wall air tightness, weatherstripping, storm doors).

TABLE 8.0 IMPLEMENTATION PLAN

BLDG. GROUP	ENERGY UPGRADE OPTION ECM1 WALL RETROFIT EXTERIOR	ECM2 WALL RETROFIT INTERIOR	ECM3 ATTIC INSULATION	ECM4 FLOOR INSULATION	ECM5 AIR TIGHTENING WALLS	ECM6 IMPROVE HEAT DISTRIBUTION	ECM7 WINDOW REPLACEMENT	ECM8 INTERIOR STORM WINDOWS	ECM9 WEATHERSTRIP WINDOWS	ECM10 INSTALL STORM DOOR	ECM11 INSULATED DOOR COVER	ECM12 METAL CLAD DOOR	ECM13 WEATHERSTRIP DOOR
A			X	X	X	X		X	X				X
B			X		X				X				X
C			X	X	X			X	X		X	X	
D			X	X	X		(X)*		X		X		X
E			X	X	X		(X)*		X	X	X		X
F			X	X	X			X	X				X
G			X	X	X		(X)*				X		X
H			X	X	X			X	X				X
I			X	X			(X)*					X	X
J			X	X	X	X		X	X	X	X		X
K			X		X	X		X	X				X
L			X	X	X	X	(X)*				X	X	

COMMENTS: This table identifies the specific energy upgrade measures for each building group.

* Based on observations some windows may need to be replaced in these categories.

The criterion used for ranking upgrade measures was the benefit - cost ratio. Benefit was defined as the amount of full cords saved as a result of implementing the specific measure.

For example: In building group F2, the installation of attic and floor insulation and interior storm windows would result in a "benefit" of 19.1 cords of wood. The total cost of the installation is estimated at $1,900. The benefit cost ratio is (19.1 x 1000) $\div$ 1,900 = 10:05 (the 1000 is simply a magnifier). The higher the ratio, the more worthy the conservation measure.

The summary of benefits, cost and ratios are presented in Table 10.0 "Benefit Costs of Upgrade Measures", and from this Table the retrofit priorities become evident.

TABLE 9.0 EFFECT OF ENERGY UPGRADE MEASURE

(ORIGINAL CONSUMPTION COMPARED TO NEW CONSUMPTION, AFTER THE IMPLEMENTATION OF UPGRADE MEASURES RECOMMENDED IN TABLE 8.0)

BUILDING GROUPS	ORIGINAL CONSUMPTION IN FULL CORDS	TYPE #1 RETROFIT NEW REDUCED CONSUMPTION IN FULL CORDS	TYPE #2 RETROFIT NEW REDUCED CONSUMPTION IN FULL CORDS		DEFINITIONS
			0.9*	0.8*	
A	9.8	8.1	7.7	7.3	Type #1 Retrofit consists of the following upgrade measures: Attic insulation (E3); Floor insulation (E4); Interior storm windows (E8); Insulation door cover (E11); Metal clad insulated door (E12)
B	9.1	8.8	8.4	7.9	
C	14.9	9.3	8.6	8.4	
D	11.7	9.8	9.3	8.8	
E	12.8	10.0	9.5	9.0	
F	12.3	9.1	8.6	8.2	Type #2 Retrofit consists of the following upgrade measures: Air tightening of walls (E5); Improved heat distribution (E6); Weatherstripping windows (E9); Install storm door (E10); Weatherstripping doors (E13)
G	23.8	8.1	7.8	7.4	
H	5.1	3.4	3.2	3.1	
I	12.8	9.9	9.5	9.0	
J	32.0	9.2	8,7	8.3	
K	6.7	5.9	5.6	5.3	* Estimated air changes per hour, as a result of the retrofit (original is assumed to be 1.0)
L	20.3	7.0	6.6	6.3	

TABLE 10.0 BENEFIT-COSTS OF UPGRADE MEASURES

BUILDING GROUPS	FULL CORDS SAVED AS A RESULT OF TYPE #1 RETROFIT (1)	COST OF RETROFIT TYPE 1 (2)	BENEFIT/ COST RATIO (3)	PRIORITY RANKING (4)	FULL CORDS SAVED AS A RESULT OF TYPE #2 RETROFIT (1) AT 0.8 AIR CHANGES	COST OF RETROFIT TYPE 2 (2)	BENEFIT/ COST RATIO (3)	NOTES:
A	1.7	$ 835.	2.0	#6	0.8	$1185.	0.7	(1) Full cords saved represent the difference between original consumption and reduced consumption from Table 9.0.
B	0.3	200.	1.5	#9	0.9	485.	1.9	
C	5.6	2370.	2.4	#3	0.9	425.	2.1	(2) Cost of retrofit per house from Table 11.0
D	1.9	1085.	1.75	#7	1.0	485.	2.1	
E	2.8	1325.	2.1	#5	1.0	750.	1.3	(3) Benefit/Cost Ratio: Full cords saved X 1000 divided by cost.
F	3.2	1475.	2.2	#4	0.9	485.	1.9	
G	15.7	(5)	-	-(5)	0.7	(5)	-	(4) Priority Ranking indicates which Building Group contributes cost-effective energy savings, based on Retrofit Type I.
H	1.7	(5)	-	-(5)	0.3	(5)	-	
I	2.9	1720.	1.7	#8	0.9	60.	15.0	(5) Retrofit Costs were not figured for Building Groups G & H because these houses were built before 1965.
J	22.8	2050.	11.1	#1	0.9	1450.	0.6	
K	0.8	635.	1.3	#10	0.6	1185.	0.5	
L	13.3	2095.	6.3	#2	1.3	925.	1.4	

7.2 PRECAUTIONS

GENERAL

There are certain considerations that apply to all house categories and all upgrade measures.

Using the checklist below will ensure that full benefits will be realized from energy upgrade measures on a long term basis.

- Check the age of the house; do not implement any upgrade measures for houses built before 1965. (According to the planning strategies of the Band Council, these houses will be replaced by new ones). A number of old houses are sound and could benefit from some of the upgrade measures.

- Check the structural condition of the house, particularly the foundation; make sure it is level and stable. (Refer to upgrade measure E4 for further precautions).

  Foundation-related problems can be the cause for bulging walls, collapsing ceilings, broken windows and sagging roofs. Unless the house is first straightened out and reinstated on a new, stable foundation, some of the retrofit measures would be wasted.

- Check the condition of the outside envelope (walls) of the house and seal all cracks and openings from the weather to protect existing wall insulation.

. Double check and co-ordinate through Band Council that there are no plans to relocate the house which is being upgraded. (Installation of conservation measures should commence only after the house has been relocated and stabilized on its new foundation).

Specific precautions apply to each of the recommended upgrade measures.

ATTIC INSULATION, ECM3

. Make sure that ceiling tiles are securely fastened and that they will handle the additional weight of the added insulation. (Ceilings were noted to be deteriorated or collapsed in housing groups B, C, D and F).

. Check that the roof is not leaking, moisture would cause a significant reduction in the insulating value and could also cause rotting of the wooden roof trusses and sheathing.

FLOOR INSULATION - ECM4

. Check that there is adequate clearance below the house, a minimum of 0.7m is recommended for access. If the house has to be lifted, make sure it is levelled and put on a stable foundation. (House types C, E, F, G, M, J and L do not have adequate access).

. Check all possible moisture leaks; seal

all outside cracks and openings before applying floor insulation.

AIR TIGHTENING OF WALLS ECM5, WEATHERSTRIPPING WINDOWS AND DOORS, ECM9 and ECM13, INSTALL STORM OR INSULATED METAL CLAD DOORS ECM10 AND ECM12.

. Remove all old weatherstripping and caulking and clean surfaces.

. Install new caulking and weatherstripping during the dry, warm season only.

IMPROVED HEAT DISTRIBUTION ECM6

This upgrade measure will result mainly in improved comfort conditions, rather than in energy savings.

7.3 TOTAL COST OF RECOMMENDED UPGRADE MEASURES

Based on the ranking and priorities established in the previous sections, the cost of upgrade measures are calculated and presented in Table 11.0. This table shows total costs, including labour, material and transportation. Table 12 shows material costs, Table 13 shows transportation costs.

TABLE 11.0 TOTAL COST OF RECOMMENDED UPGRADE MEASURES

BLDG. GROUPS	NO. OF HOUSES	TYPE #1 RETROFIT COSTS ($) PER HOUSE							TYPE #2 RETROFIT COSTS ($) PER HOUSE							ALL RECOMMENDED MEASURES	
		Attic Insulation ECM3	Floor Insulation ECM4	Interior Storm Windows ECM8	Insulated Door Cover ECM11	Metal Clad Insulated Door ECM12	Cost Per House	Cost For Community	Air Tightening Walls ECM5	Improve Heat Distribution ECM6	Weatherstrip Windows ECM9	Install Storm Doors ECM10	Weatherstrip Door ECM13	Cost Per House	Cost For Community	COST PER HOUSE	COMMUNITY COST
A	22	410	200	225	-	-	835	18,370	225	700	200	-	60	1,185	26,070	2,020	44,440
B	26	200	-	-	-	-	200	5,200	225	-	200	-	60	485	12,610	685	17,810
C	43	850	750	225	75	470	2,370	101,910	225	-	200	-	-	425	18,275	2,795	120,185
D	9	410	800	-	75	-	1,085	9,765	225	-	200	-	60	485	4,365	1,570	14,130
E	4	650	600	-	75	-	1,325	5,300	225	-	200	265	60	750	3,000	2,075	8,300
F	11	650	600	225	-	-	1,475	16,225	225	-	200	-	60	485	5,335	1,960	21,560
I	19	650	600	-	-	470	1,720	32,680	-	-	-	-	60	60	1,140	1,780	33,820
J	7	850	900	225	75	-	2,050	14,350	225	700	200	265	60	1,450	10,150	3,500	24,500
K	7	410	-	225	-	-	635	4,445	225	700	200	-	60	1,185	8,295	1,820	12,740
L	5	650	900	-	75	470	2,095	10,475	225	700	-	-	-	925	4,625	3,020	15,100
								$218,720							$93,865		$312,585

NOTE: For cost of material and transportation, refer to Tables 12 and 13.

TABLE 12.0 TOTAL COST OF MATERIALS FOR UPGRADE MEASURES

BLDG. GROUPS	NO. OF HOUSES	TYPE #1 RETROFIT COSTS ($) PER HOUSE							TYPE #2 RETROFIT COSTS ($) PER HOUSE							ALL RECOMMENDED MEASURES	
		Attic Insulation ECM3	Floor Insulation ECM4	Interior Storm Windows ECM8	Insulated Door Cover ECM11	Metal Clad Insulated Door ECM12	Cost Per House	Cost For Community	Air Tightening Walls ECM5	Improve Heat Distribution ECM6	Weatherstrip Windows ECM9	Install Storm Doors ECM10	Weatherstrip Door ECM13	Cost Per House	Cost For Community	COST PER HOUSE	COMMUNITY COST
A	22	210	90	115	-	-	415	9,130	130	400	100	-	35	665	14,630	1,080	23,760
B	26	90	-	-	-	-	90	2,340	130	-	100	-	35	265	6,890	355	9,230
C	43	550	500	115	40	300	1,505	64,715	130	-	100	-	-	230	9,890	1,735	74,605
D	9	210	400	-	40	-	650	5,850	130	-	100	-	35	265	2,385	915	8,235
E	4	375	400	-	40	-	815	3,260	130	-	100	215	35	480	1,920	1,295	5,180
F	11	375	400	115	-	-	890	9,790	130	-	100	-	35	265	2,915	1,155	12,705
I	19	375	400	-	-	300	1,075	20,425	-	-	-	-	35	35	665	1,740	21,090
J	7	550	625	115	40	-	1,330	9,310	130	400	100	215	35	880	6,160	2,210	15,470
K	7	210	-	115	-	-	325	2,275	130	400	100	-	35	665	4,655	990	6,930
L	5	375	625	-	40	300	1,340	6,700	130	400	-	-	-	530	2,650	1,870	8,570
								$133,795							$52,760		$186,555

NOTE: These costs do not include labour or transportation.
For total costs, refer to Table 11.0.
For cost of transportation, refer to Table 13.0.

TABLE 13.0 TOTAL COST OF TRANSPORTATION FOR UPGRADE MEASURES

BLDG. GROUPS	NO. OF HOUSES	TYPE #1 RETROFIT COSTS ($) PER HOUSE							TYPE #2 RETROFIT COSTS ($) PER HOUSE							ALL RECOMMENDED MEASURES	
		Attic Insulation ECM3	Floor Insulation ECM4	Interior Storm Windows ECM8	Insulated Door Cover ECM11	Metal Clad Insulated Door ECM12	Cost Per House	Cost For Community	Air Tightening Walls ECM5	Improve Heat Distribution ECM6	Weatherstrip Windows ECM9	Install Storm Doors ECM10	Weatherstrip Door ECM13	Cost Per House	Cost For Community	COST PER HOUSE	COMMUNITY COST
A	22	75	35	30	-	-	140	3,080	10	75	20	-	5	110	2,420	250	5.500
B	26	35	-	-	-	-	35	910	10	-	20	-	5	35	910	70	1,820
C	43	175	125	30	5	25	360	15,480	10	-	20	-	5	30	1,290	390	16,770
D	9	75	100	-	5	-	180	1,620	10	-	20	-	5	35	315	215	1,935
E	4	150	100	-	5	-	225	1,020	10	-	20	15	5	50	200	305	1,220
F	11	150	100	30	-	-	280	3,080	10	-	20	-	5	35	385	315	3,465
I	19	150	100	-	-	25	275	5,225	-	-	-	-	5	5	95	280	5,320
J	7	175	200	30	5	-	410	2,870	10	75	20	15	5	125	875	535	3,745
K	7	75	-	30	-	-	105	735	10	75	20	-	5	110	770	215	1,505
L	5	150	200	-	5	25	380	1,900	10	75	-	-	-	85	425	465	2,365
								$35,920							$7,685		$43,605

NOTE: These costs do not include material or labour.
For material costs, refer to Table 12.0.

8. SOURCES OF FUNDING FOR ENERGY CONSERVATION

An important component for any upgrade activity has to be funding - to procure the necessary materials and supplies, and to pay the workers. Therefore, one of the tasks of this project was to carry out a brief overview of sources of funding that the Band Council could pursue to support energy upgrade work.

8.1 Federal Programs

The 1984 copy of the "Index to Federal Programs and Services" was thoroughly reviewed to identify programs that would support the necessary energy retrofit activities in Attawapiskat.

After a preliminary screening, several programs were identified for further evaluation. A brief descriptive summary of each of these programs is outlined below. To confirm the suitability of the various programs, contacts were made with people within Canada Mortgage and Housing Corporation, Energy, Mines and Resources Canada, and Indian and Northern Affairs Canada.

8.1.1 Canada Mortgage and Housing Corporation Programs

Residential Rehabilitation Assistance Program (RRAP):

Financial assistance is available to assist residential propery owners in designated areas to bring their properties up to minimum health and safety standards.

Rural and Native Housing Program (RNHP):

This program combines all the resources of the National Housing Act for the benefit of rural and native peoples. Financial support is available through a variety of grant and loan arrangements to assist families living in rural communities of 2,500 people or less in improving their housing conditions.

According to the "Rural and Native Officer" at CMHC, "RRAP" is applicable but "RNHP" is not presently suitable. Under the RRAP program - $25,000. per unit is available for homes in Attawapiskat. Of this $25,000., $6,250. would be a forgivable grant and the remainder would be a loan at current rates. Some of the repairs of foundations, doors and windows could be covered by the RRAP program.

NOTE: CMHC Contact -

Pat Barret
Rural and Native Officer
Canada Mortgage and Housing Corporation
Ontario Regional Office
Atria North, Room E222
2255 Sheppard Avenue East
Willowdale, Ontario
M2J 4Y1

Telephone No.: 416-498-7300

8.1.2 Energy, Mines and Resources Canada Programs

Canadian Home Insulation Program (CHIP):
This program is administered by EMR to promote residential energy conservation. The processing of grants is carried out by the Canada Mortgage and Housing Corporation under contract with EMR. Under this program, owners, landlords, or tenants may receive up to $500. for the insulation and air sealing of single family homes, or rowhouse units.

To be eligible, a structure must be a principal residence no more than three storeys high, that was built in Ontario before 1 September 1977.

The CHIP program, administered by EMR is also suitable for the retrofit of homes in Attawapiskat. A taxable grant of $500. per housing unit is available. Either the Band or the tenant could apply. The $500. can be used for material or labour, but in Attawapiskat, it could only be used against the price of the material unless CGSB approved insulation installers were used.

NOTE: EMR/CHIP Contact -

Canadian Home Insulation Program Office
650 Lawrence Avenue West
Post Office Box 1270, Station 'T'
Toronto, Ontario M6B 4A4

Telephone No.: 416-789-0581
"Liz Sky"
1-800-268-1818

8.1.3 Indian and Northern Affairs Canada Programs

Indian Reserves/Engineering and Architecture:

The Department provides a full range of planning, design, construction, technical operations, and maintenance services, both directly and in the form of advice and support to Bands, for the infrastructure and buildings on Indian reserves.

Indian and Inuit/Housing:

The Department administers housing programs, including housing subsidies and guarantees of loans by the Minister of Indian Affairs and Northern Development for Indian, on-reserve housing from the Canada Mortgage and Housing Corporation and from approved lenders under the National Housing Act. Forgivable second mortgages are available for status Indians and Inuit qualifying for first mortgages to purchase a house outside a reserve.

Discussions with Indian and Northern Affairs Canada officials indicate that the Indian Reserves/Engineering and Architecture program is primarily advice, but there is money available under the Indians and Inuit Housing Program. The money loaned to the Band at a low interest rate for the construction of new housing units has a predetermined amount designated for the maintenance and renovation of new housing units. Indian and Northern Affairs Canada also has funds available under this program to allow for the maintenance and rehabilitation of older housing units - roughly $6,000. per unit is available.

In addition to these funds, Indian and Northern Affairs Canada has suggested that some money will be available from the "CMHC II - RNHP" program in January 1985. There is also money available through INAC to pay the wages of the people involved in the remedial work. Social assistance transfers that essentially transfer social assistance dollars into a salary are available and funding may be available through the Canada Works program to train selected local people with the skills necessary to perform the building repairs.

NOTE: INAC Contact -

Mr. Tom Goff
Indian and Inuit Affairs
Ontario Regional Office
25 St. Clair Avenue East
5th Floor
Toronto, Ontario
M4T 1M2

Telephone No.: 416-966-5544

8.1.4 Federal Program Summary

To summarize, the following federal funds are applicable for upgrading housing units in Attawapiskat:

CMHC	$ 6,250.00
EMR	500.00
INAC	6,000.00
	$12,750.00 per unit

8.2 Provincial Programs (Ontario)

The 1984 copy of "Energy Incentives for Business" - an Ontario Ministry of Energy Publication, was reviewed and confirming telephone calls were made to verify the applicability and currency of these programs. The aim of most of these programs is to provide technology and information transfer, not direct subsidy.

Housing Renovation and Energy Conservation Unit (HREC)

HREC provides technical bulletins on a wide range of renovation and conservation topics including sealing and weatherstripping, insulation and air quality. Individuals, housing developers, builders, manufacturers, municipalities and provincial and federal agencies involved with housing renovation and energy conservation may obtain technical advice and information from HREC.

Contact: Housing Renovation and Energy Conservation Unit
Ministry of Municipal Affairs and Housing
770 Bay Street
Toronto, Ontario
M5G 2E5

Mr. Peter Cridland

The Joint Municipal/Provincial Energy Conservation Program

Municipalities are eligible for energy-conservation technical advice and assistance. Municipalities may obtain advice on a wide range of conservation topics from the Ministry of Energy. The Ministry recommends that each municipality appoint an energy co-ordinator to identify specific areas for energy savings and to establish reduction targets. Technical information is available from the Association of Municipalities of Ontario.

Contact: Hildagarde Koecher
Program Co-ordinator
Association of Municipalities of Ontario
100 University Avenue, Suite 902
Toronto, Ontario
M5J 1V6 416-593-1441

9.0 RECOMMENDATIONS FOR FURTHER ENERGY RELATED IMPROVEMENTS (ie. How To Make The Implementation Plan Work)

As a result of the field inspections and the analysis of the building data some overall recommendations for further energy efficient improvements for the community have been identified.

The improvements either relate to the existing structures or to the new buildings and have been presented in that format:

9.1 EXISTING BUILDINGS

- Establish a program to resolve the serious foundation problems associated with the majority of the housing units in Attawapiskat.

- Once the buildings are properly levelled and placed on an adjustable foundation, individuals should be assigned the task of adjusting the buildings as required to ensure that the structures remain properly levelled.

- Using the Implementation Plan as a guide, order sufficient materials to retrofit the houses - start with the units with the most serious heat loss problems.

- People assigned to the retrofit work should thoroughly review the EMR publication, "Keeping the Heat In" to ensure that the basic principals of energy retrofit are clearly understood prior to starting the work.

- As much as possible, encourage the homeowners to assist the trained individuals during the building energy retrofits. With guidance from one trained individual there are several measures that could be completed by the occupants.

- Encourage an energy conservation program that involves an ongoing annual awareness of energy conservation principals. It is important that storm windows, insulated door plugs, etc. that may be removed during the summer are properly installed prior to the heating season. Weatherstripping may also need adjustment or replacement on an annual basis.

- Implement a monitoring program with the participation of community members.

  Houses, where upgrade measures have been implemented, should show reductions in wood consumption; by monitoring new reduced consumption, the community could increase energy conservation awareness.

9.2 NEW BUILDINGS

- Ensure that the foundations under the new buildings are adjustable so that when the building settles it can be re-levelled.

- The thermal performance of the window units could be greatly improved by selecting a casement, awning or hopper window unit. The weatherstripping on this type of unit is more durable and effective and is less affected by building settlement.

- Some air sealing techniques should be incorporated into the new houses during the framing and insulation stages. For example, the gap between the base plate and the subfloor should be caulked, the vapour barrier should be sealed directly against the window and door frames and any electrical outlets or ceiling light fixture boxes should be properly wrapped with polyethylene. Any openings into the attic around electrical wires, etc., should also be properly sealed.

10. POTENTIAL PROGRAM TRANSFER TO OTHER COMMUNITIES

In order to assess the potential for the application and implementation of a similar approach and program for energy conservation through thermal upgrading of homes, a short visit was made to the nearby communities of Fort Albany and Kashechewan. The main purpose of the visit was to observe the range of types, and the apparent condition, of the houses and other buildings in these communities.

During the visits to Fort Albany and Kashechewan, short visits were made to the Band Council offices and to other community facilities. Walking tours were taken to observe the range and apparent condition of the houses. Observations of housing were made solely from the exterior; no visits were made into homes to observe the nature and condition of the interiors. Observations of the types and styles of houses strongly suggest that little (if any) difference would be found between the interiors of homes in Fort Albany and Kashechewan from that observed in Attawapiskat.

The majority of houses observed in Fort Albany and Kashechewan would appear to be quite readily identified with the various 'type categories' outlined for the Attawapiskat houses. A few 'one of a kind' types were observed in each community, but since they only represent a small portion of the total stock they can be included in the 'general' category.

The communities of Fort Albany and Kashechewan were selected for the brief visits because of their proximity to Attawapiskat, and the subsequent ease of access.

The similarity of housing between these communities is as expected, since the communities are located in the same geographical area and exposed to generally similar conditions; and the housing programs in each of the these communities had been administered by the same government agencies since the early 1970's. We therefore conclude that a program similar to that being developed for Attawapiskat could be quite readily applied in other communities such as Fort Albany and Kashechewan.

From our past experience and visits to other remote and northern communities, recognizing that there would be some differences in housing and building types, the program format and approach used at Attawapiskat can be readily adapted to any community in the northern or remote regions of Canada.

APPENDIX A

ATTAWAPISKAT COMMUNITY BUILDING
EVALUATION CHECKLIST -

General
Detailed

House No. 492
File No. S.8415

Attawapiskat Community Building Evaluation Checklist

Version: General

- Inspection Date/Time: April 16, 1984/ : PM
- Inspector(s): O Teralan
- Ext. Photo Taken ☑ Ext. Dimensions Recorded ☑
  73 ' x 11 ' (if rectangular)
- Interior Temperature/Humidity Measurements
  Location: Living Room
  DB 80 °F; WB 62 °F; RH 35 %
- Building Description:
  - Foundation: Wood block.
  - Roof/Attic: Flat ☐ Std. Attic ☑ Insulated Panels ☐
    Comments:
  - Finishes: Exterior Walls Hardboard
    Roof Shingles
    Interior Walls Panel
    Ceiling 12 x 12 Ceiling Tile
    Floors 12 x 12 Tile
  - Insulation: Walls FG 9"
    Floors FG 9"
    Roof/Attic FG 9"
  - Type of Building: Frame
    # of stories 1; Year built _____ or age _____
  - Comments

☐ Access was not available to the interior of this building.
Comment:

Main Energy Upgrade Needs:
(Based on visual inspections)

- Mechanical System: Type Wood stove
  General Condition:

. Windows: Type: Casement - Hwy. Windows
Single ☐ Double ☑ Storm - Wood ☐ Aluminum ☐
Poly ☐ Thermopane ☐

Tightness: Good ☑ Poor ☐

Weatherstripping: Good ☑ Poorly Fitted ☐ Nil ☐

Comments: _____

. Doors:

	Front	Side	Rear
Single Door Set	✓		
Double Door Set		✓	
Wood - Hollow Core			
- Solid Core	✓	✓	
Metal Clad - Insulated			
Glazing - None	✓	✓	
- Single			
- Double			
Storm Door - None		✓	
- Wood	✓		
- Alluminum			
Weatherstripping	✓	✓	

. Venting: No/

- Exhaust Fans:

Kitchen ☐ Vented to exterior ☐

Bathroom ☐ Vented to exterior ☐

- Dryer exhaust vented to exterior? Yes ☐ No ☐

. Attic Venting: 2 Gable vents

Eave - continuous ___ Ridge - continuous ___
- individual ___ - individual ___
- nil ___ - nil ___

Roof ☐ #_____

. Other Energy Upgrade Needs: _____

9.0 Indication Of Problems:

Problem:	Living	Dining	Kitchen	Bathroom	Bedroom #1	Bedroom #2	Bedroom #3	Basement
Ceiling	✓	✓	✓	✓	✓	✓	✓	
Staining								
Mould								
Water in Fixtures								
Dust Marking								
Deterioration								
Collapse								
Walls								
Staining								
Mould:								
General								
Behind Drapes								
In Closets								
Dust Marking								
Deterioration								
Windows								
Inner Pane Frosting/Condensation								
Outer Pane Frosting/Condensation								
Frame Rotting								
Wall Deterioration Below								

House No. 262
File No. S.8415

Attawapiskat Community Building Evaluation Checklist

Version: Detailed

Inspection Date/Time:

Tentative: April ____, 1984 /____:_____
Actual: April 11, 1984 /3:2- PM

Inspector(s): A Cameron
D Jeralan

Photo Record Completed ☑

Building Dimensions Recorded ☑

Heating System Data Recorded ☑

Fiber Optic Analysis Completed ☑

Temperature/Humidity Measurements Taken ☐

Moisture Probes Completed ☑

Comfort Level Assessment Completed ☑

Visual Observation Completed of: Attic ☑ Underside of Bldg. ☐

Thermography Completed: Exterior ☐
Interior ☐

1.0 Building Description

Type of House: Frame
# of stories 1; Year built '78 or Age _____
Comments: _____

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HOUSE LAYOUT/DIMENSIONS

File No.: 8415

Date: 11/4/84

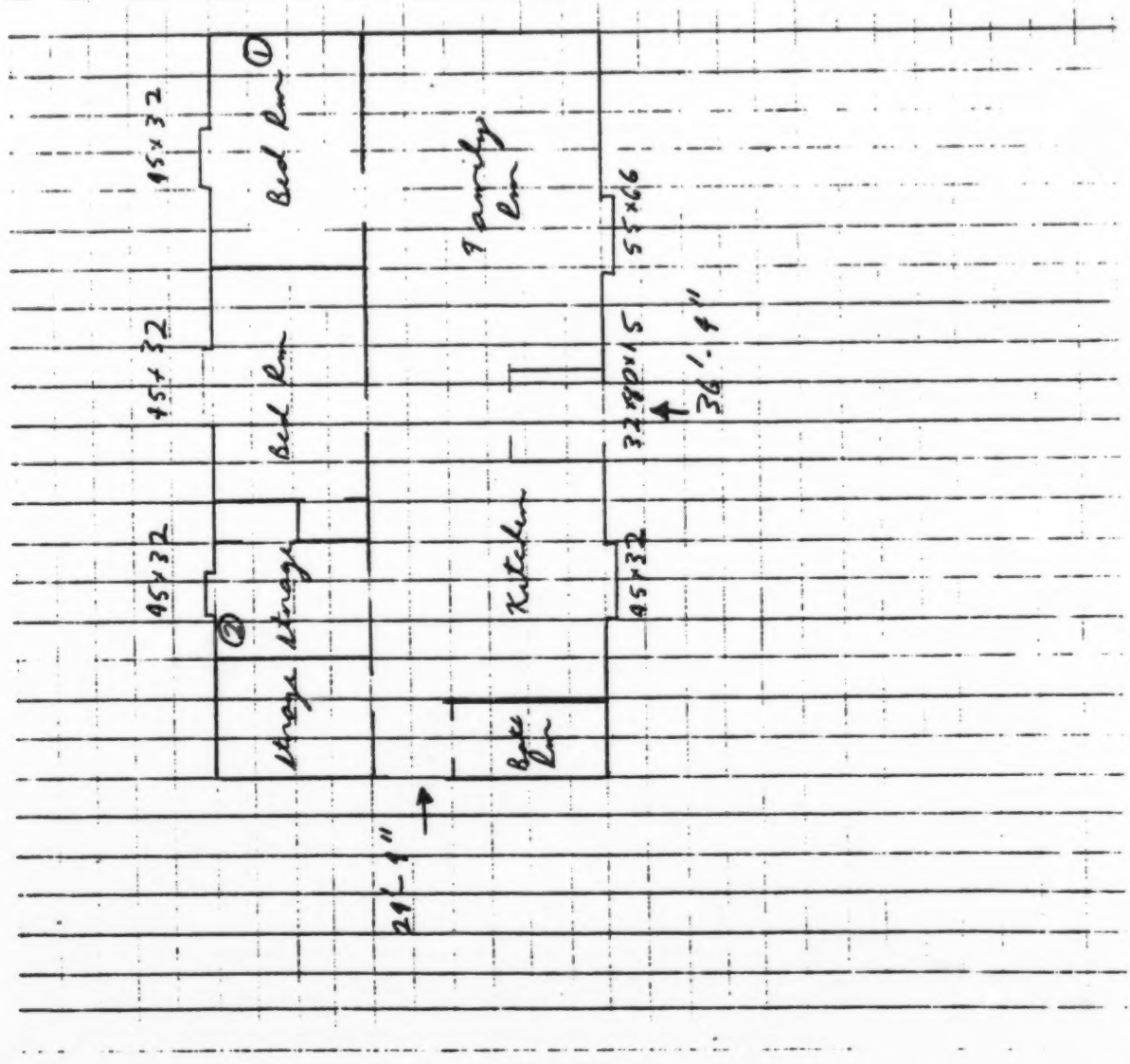
Community: ATTAWAPISKAT

House No.: 262

Sketched by: A. Cameron.

Location:

ORIENTATION



2.0 MECHANICAL SYSTEM DATA

2.1

	Type of Fuel Used				
	Oil	Gas	Elec.	Coal	Other
Heating system (s) Steam or Hot Water					wood
Hot Air: Forced / Gravity					
Electricity: Radiant Baseboard					
Domestic Hot Water					
Appliances Ranges			water heater freezer hot plate		
Dryer					
Other Wood-Chief Heresc WC-100C					

2.2 Humidifiers:

None ☑ Furnace Plate Type ☐

Furnace Drum Type ☐ Portable Console Type ☐

2.3 Is a combustion air intake present on heating system? Yes ☐ No ☑

2.4 Is dryer exhaust vented to exterior? NIL Yes ☐ No ☐

2.5 Exhaust Fans:

None ☑

Kitchen ☐ Vented to exterior ☐ Flowrate (CFM) ☐

Bathroom ☐ Vented to exterior ☐ Flowrate (CFM) ☐

Attic ☐

Other ☐ _____

3.0 PRESENT INSULATION LEVELS

(Based on Fiber Optic Analysis and Visual Observations)

Insulation Type	Insulation Thickness (Inches)			
	Wall	Ceiling/ Attic	Base-ment	Floor (over unheated area
Batts - Fibreglass Rockwool	4"	6"		4"
Slab Insulation Sytrofoam Other _____				
Blow Insulation Foam Cellulose Mineral Wool				
Air/Vapour Barrier Type	✓	NO		
Other Insulation FB.	sheathing			

4.0 INSPECTION DATA

4.1 Relative Humidity & Temperature Measurements:

Location	Date & Time	Wet Bulb Temper-ature	Dry Bulb Temper-ature	Relative Humidity	Outdoor Temper-ature
Family	3 40	65	47	20	
	11/4				
Bed	3 40	65	48	24	
					55/43

4.2 Moisture Probe Measurements:

Location	Material	Date	Moisture Meter Reading
1 Bed	sill	11/4	-6 0%
	sheath		8.5 %
2 Storage	sheath		9 5 %
	sill		-6.0%

5.0 ASSESSMENT OF HOME COMFORT LEVELS

Please assess the comfort level within the main living area of your home (i.e., exclude basement and storage rooms) related to each of the following criteria during recent heating seasons.

	Good	Poor
Humidity Level	✓	
Room Temperature	✓	
Floor Temperature		✓
Heat Distribution	✓	
Odour		✓
Drafts - Doors		✓
- Windows	✓	
- Floor Area	✓	
- Fireplace	-	-
- Electrical Outlets	✓	

For any criteria which has been marked "Poor" please comment

_____

_____

_____

6.0 DWELLING EXTERIOR ANALYSIS

6.1 Chimney: Type Stove Pipe Number 1
Condition Good.

6.2 Roof: / Buckling ___ Waviness ___ Ice Daming ___
Comments _____

6.3 Soffit Condition: Peel ☐ Rot ☐ Good
Slope - In line with roof ☐ Flat ☐
Soffit Vents ☑
Comments Vinyl

6.4 Exterior Siding: Type Vinyl Gen. Tightness Fair
Caulking around doors and windows _____

Paint condition (blistering, peeling, etc.) _

6.5 Foundation:

Type Wood Block.
Average Measure above Ground Level - 2'-6"
Does grade slope away from house? Yes ☐ No ☑
Skirtboard, etc. Rot ☐ Water Marking ☐
Under-skirt edge Dry

Comments _____

6.6 Windows:

Condition of sills/frame water stains

7.0 DWELLING INTERIOR ANALYSIS - Construction Details

7.1 Interior Wall Finish:

Type panel

Condition loose - no backing
Detailing at corners poor
Mouldings rough - loose
Comments

7.2 Windows:

	Living	Dining	Kitchen	Bathroom	Bedroom #1	Bedroom #2	Bedroom #3	Basement
Type: Fixed	✓							
Single hung								
Slider	✓		✓		✓	✓		
Awning								
Casement								
Glazing: Single	✓		✓		✓	✓		
Double								
- Poly								
- Storm Alum			✓		✓	✓		
- Storm Wood								
- "Thermopane"	✓							
Tightness - Good								
- Poor	✓		✓		✓	✓		
Weatherstripping:								
- Nil			✓					
- Poorly Fitted	✓				✓	✓		
- Good								

Comments: most windows cracked or broken

7.3 Ceiling:

Type 12"x12" Tile (FB. backing)
Condition fair - scuffed.
Comments mold in corners.

7.4 Attic:
Type Full / Finish
Size as per plan
Attic venting -
Power ☐ Eave-Continuous ☑ Ridge-Continuous ☐ Roof ☐
-Individual ☐ -Individual ☐
Condition/Comments _____
_____
Attic Hatch:
Location ☑ Insulated ☑ Weatherstripped ☑

7.5 Basement: Nil ☑
Full ☐ Crawl ☐ Dirt Floor ☐ Concrete Floor ☐
Sump ☐
Finished:
Floor ☐ Wall ☐ Ceiling ☐ % of Total ☐ %
Cracks present: Floors ☐ Walls ☐
Comments _____
_____

7.6 Doors:

	Front	Side	Rear
Single Door Set		✓	
Double Door Set	✓		
Wood - Hollow Core			
Solid Core	✓	✓	
Metal Clad - Insulated			
Glazing - None	✓	✓	
- Single			
- Double			
Storm Door - None			
- Wood			
- Aluminum			
Weatherstripping	P-L	P-L	

8.0 RECENT ENERGY RETROFIT ACTIVITIES

6.1 Areas Retrofitted:

Attic/Ceiling	☐	New Windows	☐
Above-grade walls	☐	Added storm windows	☐
Basement walls	☐	New Doors	☐
Floors	☐	Added storm doors	☐
Caulking	☐	Weatherstripping	☐

Date of Retrofitting _____

Other: _____

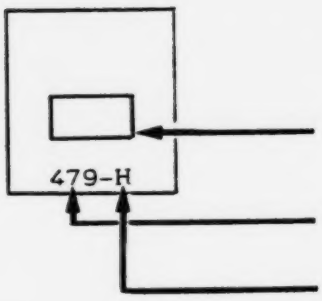
9.0 INDICATION OF PROBLEMS

Problem:	Living	Dining	Kitchen	Bathroom	Bedroom #1	Bedroom #2	Bedroom #3	Finished Basement	Unfinished Basement	Attic
Attic Roof Space										
Water Marking										
Rot										
Frost/Condensation										
Mould										
Moisture in Insulation										
Ceiling										
Staining	✓		✓	✓	✓	✓				
Mould	✓		✓	-	✓	✓				
Water in Fixtures										
Dust Marking										
Deterioration	✓		✓	✓		✓				
Collapse										
Walls										
Staining		✓								
Mould:										
General										
Behind Drapes										
In Closets										
Bulging										
Deterioration										
Windows										
Inner Pane Frosting/Condensation										
Outer Pane Frosting/Condensation										
Frame Rotting										
Wall Deterioration Below										
Basement /Underside of Bldg										
Mould										
Efflorescence										
Damp										
Water Running from behind Insulation										
Bulging of insulation/ finish										

APPENDIX B

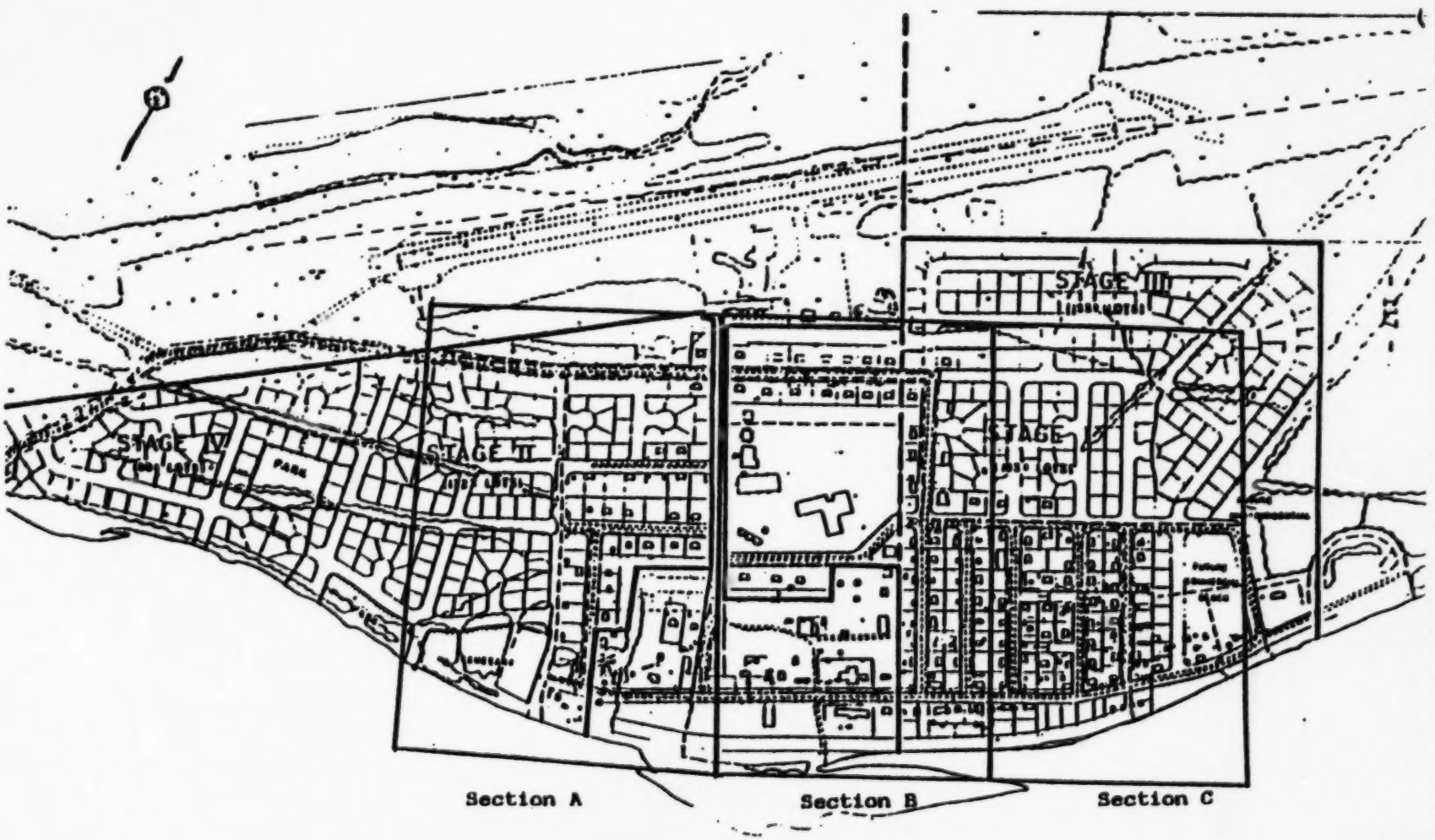
ATTAWAPISKAT COMMUNITY PLAN - LEGEND

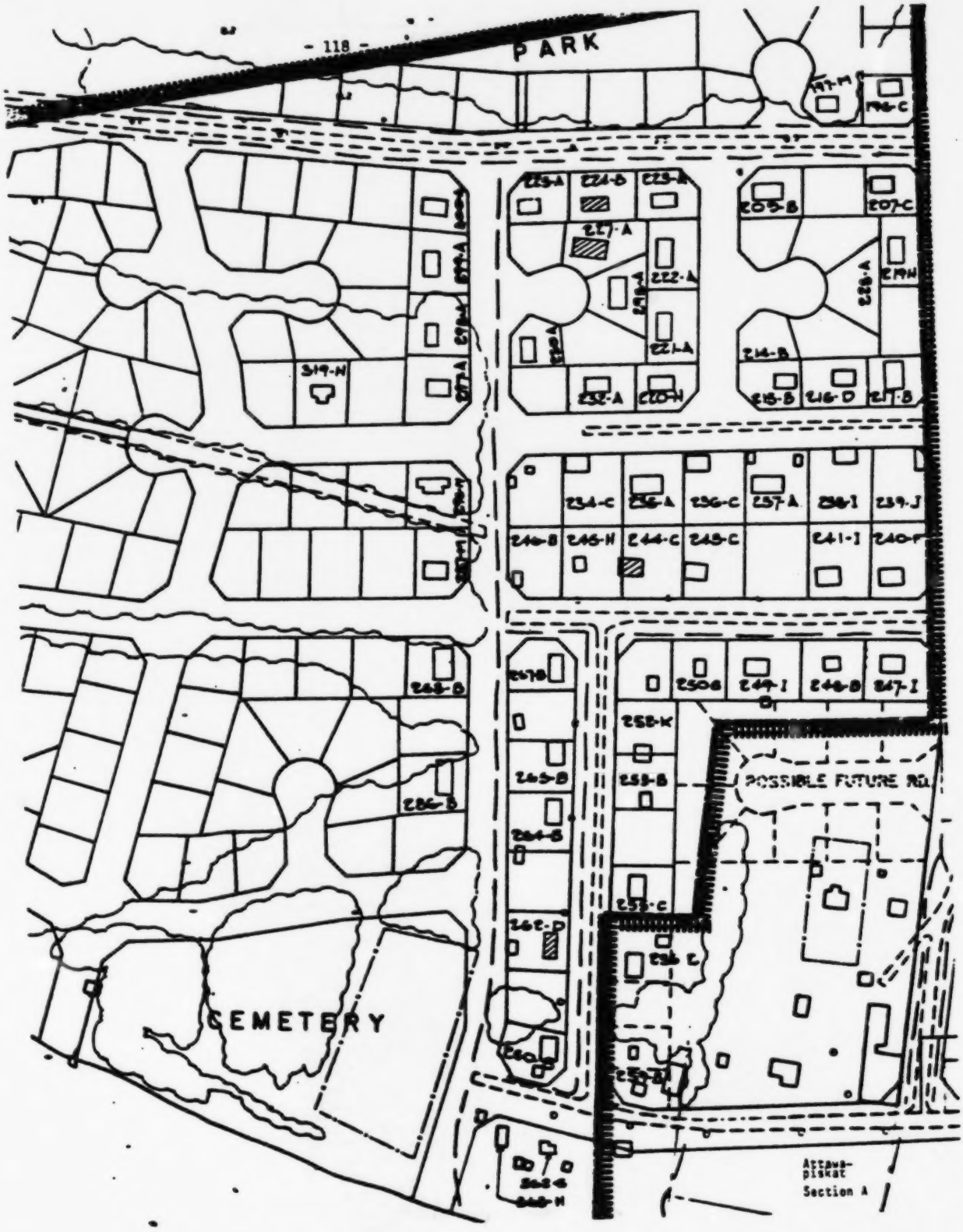
ATTAWAPISKAT COMMUNITY PLAN - LEGEND

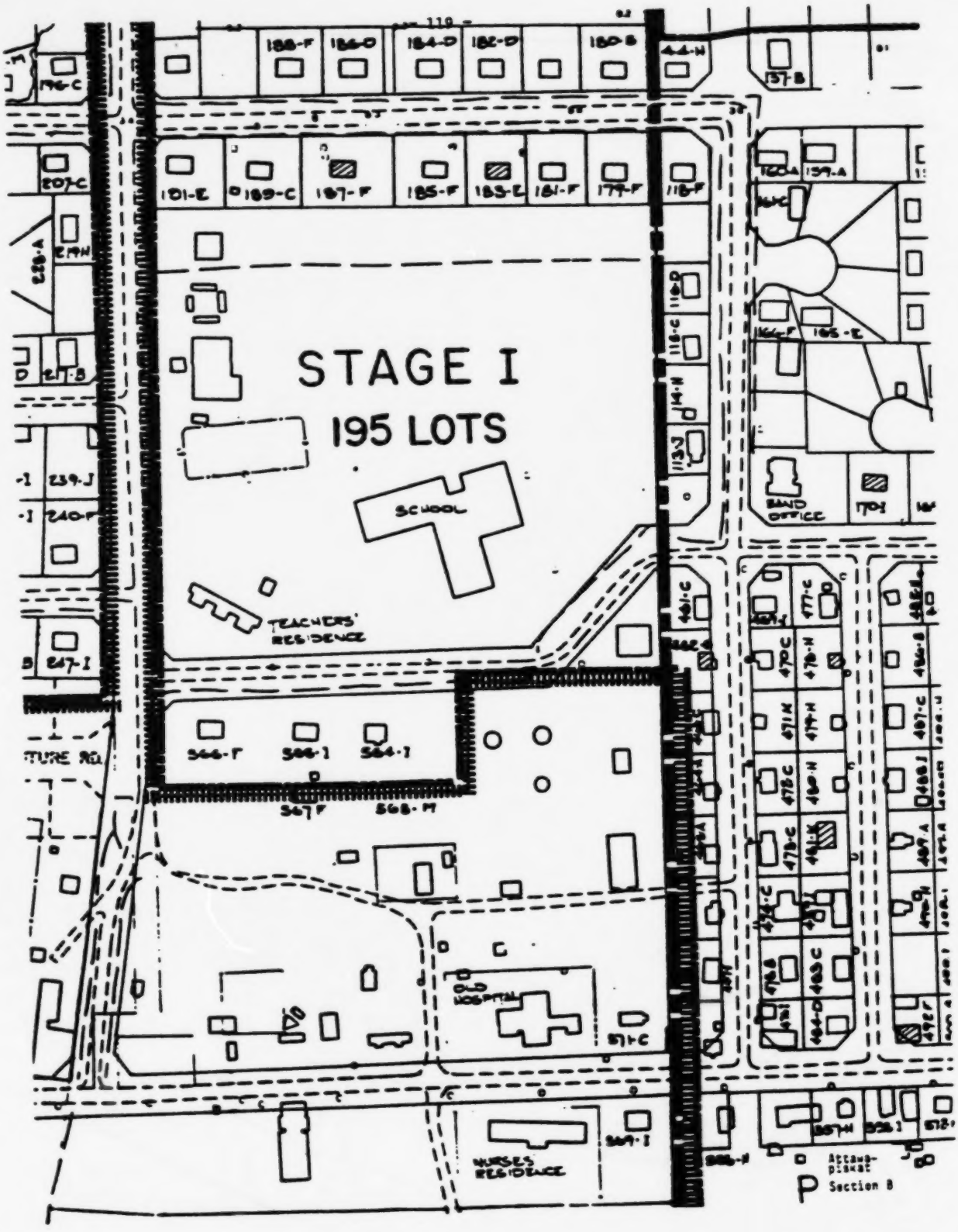


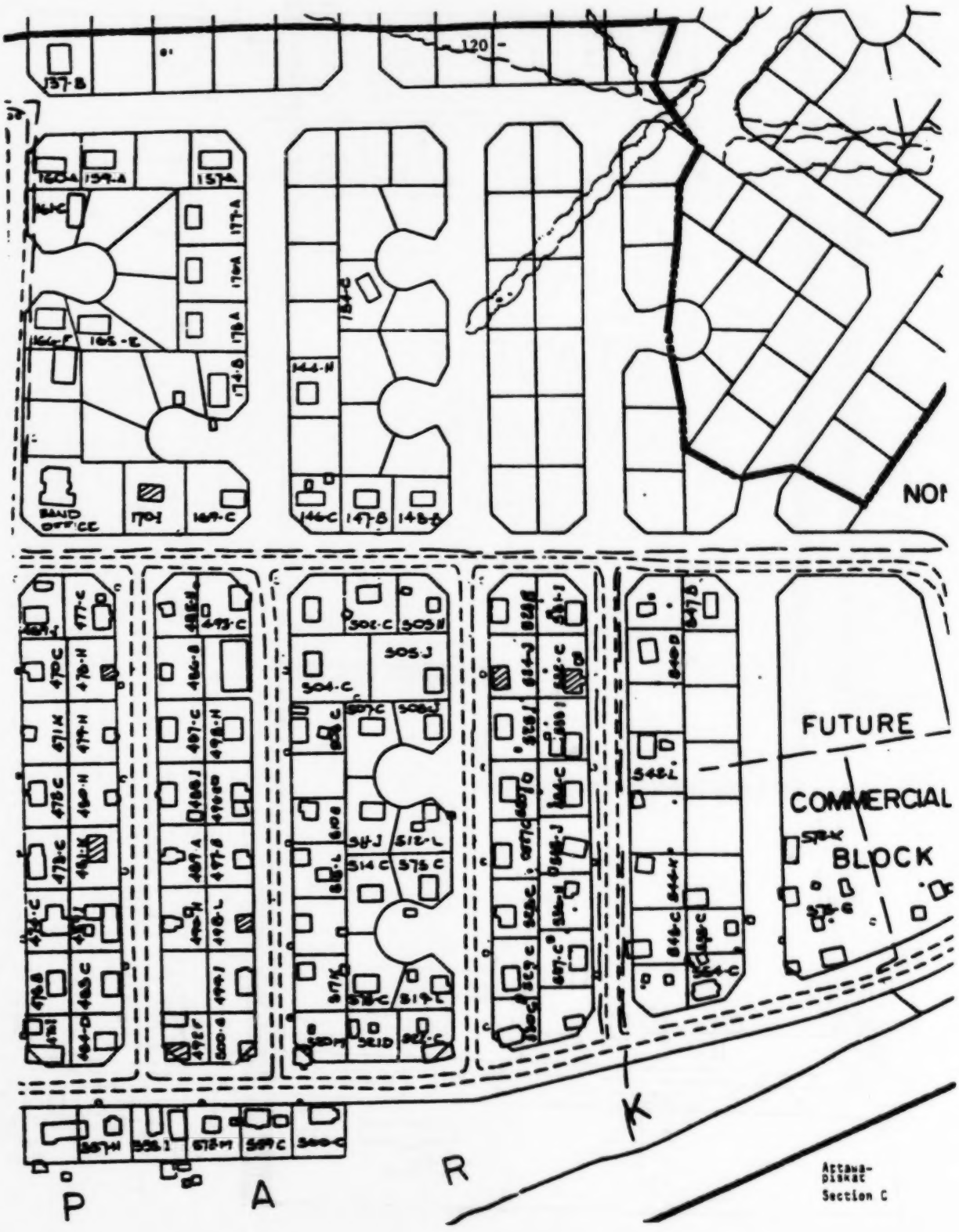
Buildings marked with lines, as shown, received a detailed inspection.

ATTAWAPISKAT COMMUNITY PLAN




PARK
CEMETERY
POSSIBLE FUTURE RD.
Attach-
plskat
Section A


STAGE I
195 LOTS
SCHOOL
TEACHERS' RESIDENCE
OLD HOSPITAL
NURSES RESIDENCE
BAND OFFICE
Section B


120
BAND OFFICE
FUTURE
COMMERCIAL
BLOCK
P
A
R
K
Section C